CANADIAN ELECTRONICS ENGINEERING

JANUARY 1959
A Maclean-Hunter publication
five dollars a year

what's ahead for electronics

1958 **INDUSTRY REVIEW & FORECAST** *1959*

The first dual TR tubes came from Bomac.
The first shutter tubes came from Bomac.
The first ceramic window TR's came from Bomac.
The first folded cylinder Pre-TR's came from Bomac.
The first phase control TR tubes (single and dual) came from Bomac.
The first miniaturized crystal protectors came from Bomac.
The first 4.3 mm duplexer, and 4.3 mm magnetron came from Bomac.
The first UHF hybrid duplexer came from Bomac.
The first phase control coaxial balanced duplexer came from Bomac.

Doesn't it make sense, then — when you have any problem whatever in microwave tube engineering, development, production — To come to Bomac first?

Leaders in the design, development and manufacture of TR, ATR, Pre-TR tubes; shutters; reference cavities; crystal protectors; silicon diodes; magnetrons; klystrons; duplexers; pressurizing windows; noise source tubes; high frequency triode oscillators; surge protectors.

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Salem Road, Beverly, Massachusetts

January 1959

Volume three, number 1

CANADIAN ELECTRONICS ENGINEERING

Departments

***our cover design** — *Art director Frank Davies has taken a bold stand, artistically speaking, to convey the feeling of all those who helped with this report on the industry's future.*

increasing component density . . . . . your job . . and Centralab's

MODEL 1
Component Density 9 per cu. in.*
Diameter 0.625"; Depth 0.371"
Rating 1/10 watt

MODEL 6
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SPECIFICATIONS:

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***Cubic inch, rather than cubic foot, is used to provide a more realistic and more readily visualized standard of comparison.**

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contributors and special articles in this issue:

Last fall a group of industry members from the Toronto area met with the staff of CEE to discuss ways in which the magazine could help the industry. Specifically, CEE asked what information the people in electronics would like to get to help them plan for the future.

The many suggestions made at the meeting were given careful consideration during the planning of this issue. Some of the suggestions will be incorporated in other issues during the year.

The staff of CEE would like to extend thanks to all those who took time out from busy schedules to attend the meeting. Also, to those who have provided assistance in the gathering of news and statistical information for this issue.

Leonard Spencer and Bernard Doiron (CKAC electronic time signal generator) pass the time of day (to their listeners) in an interesting way. The tone generator is described in this story, and there will be another one soon to describe how the McGill Observatory time signal is used to regulate the clocks at CKAC, Montreal.

Mr. Spencer, who was born in Birmingham, England, but moved to Montreal at the age of six, is one of the real pioneers of radio. In 1918 he became an apprentice with the Marconi Co. at a time when there were just two types of radio engineers: transmitter and receiver.

In 1932 he installed and operated Canada's first TV station. He supervised the first Canadian radio chain joining Montreal, Toronto and Hamilton (1925), co-operated with the CNR in establishing the Trans-Canada network in 1926.

Mr. Doiron obtained his 2nd class radio operator's license in 1945, graduated from Capitol Radio Engineering Institute in 1947, and presently is studying at Canadian Institute of Science & Technology.

From 1946 to 1953 Mr. Doiron was employed at the CKAC transmitter site, St. Hyacinthe. In 1953 he went to the Montreal studios of CBC as a TV technician. He is now back at CKAC doing installation and maintenance work.

GRANT COLLINGWOOD

Industry meeting

JACK MARKOW

Doiron and Spencer

a Maclean-Hunter publication

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Indexed in Engineering Index.

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BNA

By using the SHF Communications band and new, much smaller components, Westinghouse has developed a powerful yet compact MICROSCATTER system. Two MICROSCATTER components are shown above: The 2 K.W. Klystron Tube (right) and a model of the microwave block.

"Here's how we put Microscatter on wheels!"

Now, Westinghouse has successfully reduced the size of microwave scatter—by developing an SHF system! And now, all radio equipment for a 5,000 mc. quadruple diversity *repeater* can be mounted in a 40-foot truck trailer.

For voice, teletype, television, facsimile and raw radar video . . . this advanced MICROSCATTER gives you high quality SHF transmission to points 100 to 200 miles away!

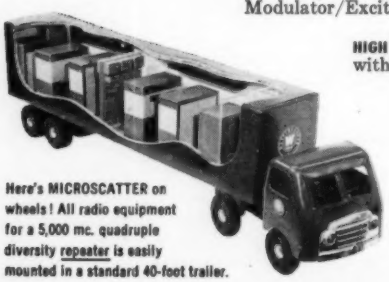
WESTINGHOUSE MICROSCATTER also gives you

HIGH QUALITY TRANSMISSION with an extremely linear, wide band Modulator/Exciter.

LOW COST PER CHANNEL MILE . . . . due to minimum operating and maintenance costs . . . and low power consumption.

HIGH RELIABILITY of up to 99.99% . . . with quadruple diversity.

SMALL, NARROW-BEAM ANTENNAS, from 8 ft. to 28 ft. in diameter.



Here's MICROSCATTER on wheels! All radio equipment for a 5,000 mc. quadruple diversity repeater is easily mounted in a standard 40-foot trailer.

For complete information, phone your nearest Westinghouse office. Or write to Canadian Westinghouse Company Limited, Electronics Division, Longwood Road, Hamilton, Canada.

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News highlights . . .

EMI buys control of Cossor (Canada) . . .

Electric & Musical Industries Ltd., England, has obtained controlling interest in Cossor (Canada) Ltd., Halifax. The new company, known as EMI-Cossor Electronics Ltd., will have these men in top positions: H. Chisholm as chairman; C. Metcalfe as managing director and president; A. C. Carter as general manager. Sales are expected to rise from the present $2 million yearly to $4-$5 million.

U. S. firm buys Canadian doppler navigator . . .

Pan American World Airways has placed an order with Canadian Marconi Co. for six Doppler Sensor navigation sets. These are to be evaluated for use with jet airliners and could lead to orders for at least another 34 sets. The navigator uses radar reflections from the ground to determine the true ground speed and distance traveled. It requires no auxiliary ground equipment.

DOT opens radio station at Churchill . . .

The Department of Transport has opened a new aeradio-marine radio station at Churchill, Manitoba. It provides a radio beacon for sea navigation, weather broadcasts and ice reports by both message and radio facsimile charts for shipping. It serves northern aviation, including the international flights using the trans-polar route. It will also serve as a main link for message services to the north beyond the areas covered by telephone and telegraph lines.

Saskatchewan Telephones will have DDD . . .

Saskatchewan Government Telephones has taken the first step towards direct distance dialing for its subscribers. Crossbar tandem equipment went into service in Regina recently, making operator distance dialing possible in several communities. There are 11 regional switching centres in Canada and the United States; Regina serves as the regional centre for western Canada.

Canadian Post Office tests new mail sorter . . .

Electronic mail sorting equipment developed in England is to be tried out by Canadian Post Office Department. The equipment will be installed in Winnipeg in the spring of 1960. The machine will separate letters from parcels, separate the letters by envelope size, stack them face up, cancel the stamps and sort them into local and out-of-town groups. Manual sorting takes over from there. To sort, the machine will need stamps with colors or graphite strips.

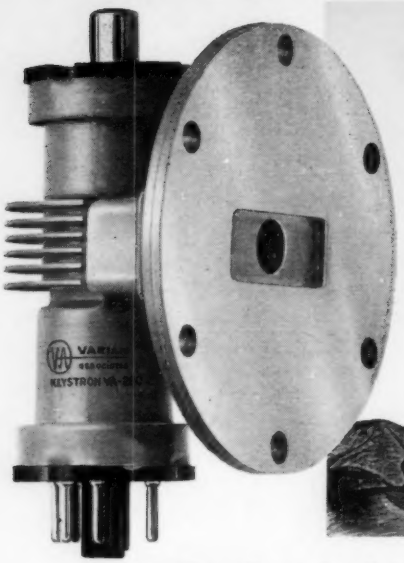
U. K. electronic exports on the increase . . .

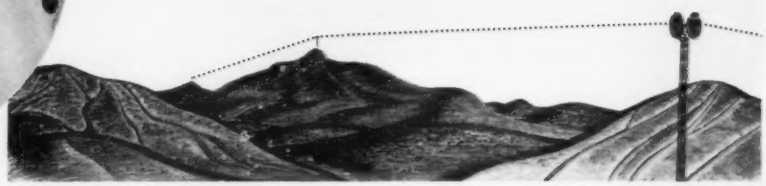
Canada was Britain's third best customer in 1957 for radio and electronic components and equipment. The United States took 10.4% of the total exports. Australia came next with 7.4%, while Canada imported 6.3% — about $7.5 million worth. This figure represents a 13-fold increase since 1949.

CRTPB: Scientists discuss radio spectrum . . .

At its fourteenth annual meeting in Ottawa, members of the Canadian Radio Technical Planning Board tackled the problem of improving television and radio reception. With over 52,000 radio transmitters in use in Canada, plus many more American stations operating near the International Boundary, authorities are concerned about space for them in the radio spectrum. They are concerned also about preventing possible interference and future overcrowding.

NOW... *the accepted standard of the Relay Industry!*





Varian's high performance relay klystron

It's the VA-220, another outstanding example of Varian design leadership... research and product engineering that brings you optimum reliability plus performance characteristics unsurpassed by any other relay klystron.

UNSURPASSED FOR EVERY RELAY APPLICATION

Microwave relay system designers and equipment buyers have long known that Varian relay klystrons are unmatched for frequency stability, power to override noise, reliability and long life. The VA-220 gives you performance that even exceeds the high standards set by Varian X-26 klystrons... at half the cost.

In the 6000 - 8000 megacycle band, VA-220 klystrons will consistently outperform all others. Here are six reasons why this sensational new klystron is your best buy for all relay applications:

THESE ADVANTAGES MEAN TOP PERFORMANCE

- **Greater Power**—VA-220 high power klystrons are conservatively rated. They will deliver **more** than rated power **without** failure.
- **Greater Frequency Stability**—VA-220 klystrons have negligible frequency drift.
- **Greater Uniformity**—Varian mass production techniques **assure** uniformity—every klystron is as reliable as a nut and bolt.
- **Longer Life**—VA-220 klystrons can be operated at full power for thousands of hours.
- **Less Distortion, Less Noise**—FM distortion and inherent noise are negligible—60 db below a 1-megacycle deviation.
- **Lower Cost**—VA-220 klystrons cost far less than any other relay klystron with comparable performance characteristics.

TYPE	FREQUENCY RANGE	RESONATOR VOLTAGE	POWER OUTPUT	BANDWIDTH	MODULATION SENSITIVITY
VA-220*	5925 - 7425 mc	750 v	1.2 watts	35 mc	375 kc/v

**VA-220 B, C, D, E and F each cover a frequency range of approximately 300 mc*

FOR COMPLETE SPECIFICATIONS

... and technical data on the VA-220 and other Varian klystrons, write to the Varian Application Engineering Department today.

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Canadian Westinghouse elevates three executives

W. J. Cheesman, manager of the Canadian Westinghouse electronics division at Hamilton since 1954, has been appointed assistant general manager, apparatus products. In the newly created post he assumes responsibility for the company's industrial control, switchgear, meter, relay and instrument, and distribution apparatus divisions.

Appointed to succeed Mr. Cheesman as electronics division manager is **G. P. Adamson.** He joined Canadian Westinghouse in 1956 as defense contracts manager and has been manager of the electronics division engineering department since June, 1957.

CAREY STUDIO

Cheesman

Adamson

CAREY STUDIO

Zimmerman

The appointment of **E. P. Zimmerman** as general manager, consumer products, for the Canadian Westinghouse Company has been announced by J. D. Campbell, executive vice-president.

In this capacity, Mr. Zimmerman will have direct responsibility for operations of the company's appliance, TV-radio, lamp and electronic tube divisions. He succeeds Mr. Campbell, who was recently elected to the post of executive vice-president.

Mr. Zimmerman joined Westinghouse in June, 1955, and was sales manager and division manager of the lamp division before being appointed general sales manager for consumer products in July of this year.

CAE appoints three directors

Canadian Aviation Electronics Limited has appointed three directors in Western Canada. They are: **T. N. Beaupre,** president of Columbia Cellulose Co. Ltd., Vancouver, and formerly Assistant Deputy Minister in the Dept. of Denfence Production; **Senator G. S. Thorvaldson,** Winnipeg, senior partner of Thorvaldson, Eggerston, Bastin, Stringer, Saunders & Mauro; **Peter D. Cury,** Winnipeg, president of Peter D. Cury & Co., Ltd.

George W. Harper

George W. Harper, founder and chairman of the board of directors of Tung-Sol Electric Inc., died at his home in Belleair, Fla., on November 23. He was 80 years old.

Born in Kiddermonster, England, in 1878, Mr. Harper formed his own company in 1904 to manufacture miniature lamps for flashlights, Christmas trees and candelabra. In 1907 he pioneered the first successful electric headlamp for cars. In 1929 he began manufacturing electron tubes.

During his lifetime he met many well-known men, including Dr. Lee deForest.

Harper

White

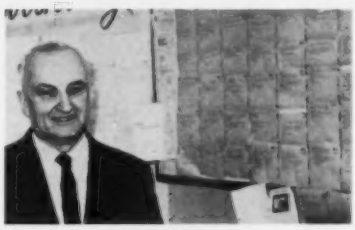
Secretary and comptroller at Standard Telephones

Standard Telephones & Cables Mfg. Co. (Canada) Ltd. has appointed **Wendell F. White,** B.Comm., C.A., as comptroller and secretary of the company.

Mr. White is from the Maritimes and received his early education in New Brunswick. He served with the RCAF from 1941-45. He graduated from McGill in 1949 and is a member of the Institute of Chartered Accountants of Quebec.

R. L. Triplett observes 75th birthday

November 13 marked the 75th anniversary of one of the pioneers of radio. **R. L. Triplett,** chairman of the board of The Triplett Electrical Instrument Co., is an ex-president of the Radio Old Timers Club. As the photograph shows, Mr. Triplett received many congratulatory messages from his friends.



Triplett

Sales manager of B. C. Transformer

It has been announced that **Percy D. Maclean** has been appointed sales manager of Transformer Co., British Columbia. This company recently entered the specialty transformer market.

Export manager of Hughes International Div.

Robert T. Jones, formerly of Beckman Instruments, Inc., has been named export manager of Hughes Aircraft Company's International Division.

Following graduation in 1947 from Occidental College, Jones worked six years for Applied Research Laboratories of Glendale, Calif., as assistant sales manager and export manager. Prior to joining Hughes he was sales manager of the Beckman international division.

Have you received a promotion recently, moved to another position, received some award, been picked for some unusual assignment, or made some new discovery? Maybe your friends would like to hear about it.

Just drop a line to The Editor giving a brief outline of the facts. We can't guarantee that your friends will hear about it—but we will give them every opportunity to read about it on this page.

As varied as the stars in the milky way Simpson Panel Instruments are produced for every possible electrical and electronic use. We thrive on designing new measuring instruments for modern applications.

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Defence Research Board opens new communications building

A new communications wing for the Defence Research Telecommunications Establishment (DRTE) at Shirley Bay near Ottawa was opened Nov. 25 to facilitate increased research in radio propagation relative to urgent defense radar communications problems. The wing was formally opened when Dr. E. W. R. Steacie, president of NRC, unveiled a plaque.

Because of Canada's unique geographical position relative to the auroral zone and to the earth's magnetic field, the country is faced with unusual communications problems. Part of the auroral zone passes over Canada and directly over Fort Churchill, Man. This effectively divides the country into separate north and south areas. Communications near the auroral belt are frequently distrubed by ionospheric storms and auroral disturbances.

Because of the need to investigate these special problems, the communications wing at DRTE has been established and is expected to make unique contributions to radio propagation and defense telecommunications research for the western world.

The presence of the aurora borealis or "northern lights" emphasizes the peculiar role that Canada can play in radar research. Ionization in the zone causes "clutter" in long-range radars that can mask small targets. This is a new problem that has arisen only recently with the advent of new, very high power radars for ballistic missile defense.

The Prince Albert Radar Laboratory, with one of the largest radars in existence is a DRTE sub-unit. The radar is being installed with USAF assistance. This facility will permit Canada to make a significant contribution to western defense in the research field of radio propagation.

Constructed as a wing of the existing DRTE building, the new communications structure includes three stories and a basement. Special grounding devices have been used so that static and other electrical interference will not affect experiments.

A series of displays were set up so that visitors attending the opening ceremonies could see the type of work being carried out by the communications wing.

One display was a CW doppler radar used to track a small projectile fired into a hypersonic range. Another demonstrated experiments made to reflect radio signals from the moon. A third included photographs and a film of the Prince Albert Radar Laboratory. In the same room was data handling equipment being developed by the DRTE electronics wing for Prince Albert.

Dr. J. H. Chapman, deputy chief superintendent of DRTE, is the superintendent of the communications wing.

J. H. Chapman, superintendent, communications wing, DRTE, Shirley Bay, explains Janet system to newsmen attending the opening of the new wing.

NRC presents two electron microscopes

As part of its program to promote research in Canada, the National Research Council has presented electron microscopes to Queen's University and the University of Saskatchewan. Each instrument is valued at approximately $30,000.

At U. of S. the electron microscope will be used eventually by all university faculty members who want to carry out research, but is designed primarily for use by the biology, anatomy and bacteriology departments.

The instrument at Queen's has been installed in the Richardson Pathological Laboratory and is available for use of the scientific department and the Faculty of Medicine.

Research scholarships

Union Carbide scholarships and fellowships totaling approximately $50,000 have been awarded this academic year to 64 university students as an aid to their education, and to support fundamental research. Science and engineering are the two most popular courses being studied by these Scholars and Fellows. Sixteen students are studying engineering, and 29 are studying science.

The grants are sponsored by Union Carbide Canada Ltd., but the selection of recipients and administration of the plan is left entirely under the jurisdiction of the participating Canadian universities.

New company formed at Brockville, Ontario

A new company has been formed in Brockville, Ontario, to manufacture aluminum wires and cables. It is the Phillips C.B.A. Conductors Ltd., and will be managed by Phillips Electrical Co. Ltd., under a management contract.

President of the new company is T. A. Lindsay, currently president of Phillips Electrical Co. Ltd. Chairman of the board is A. S. Torrey — chairman of W. C. Pitfield & Co. Ltd., Montreal.

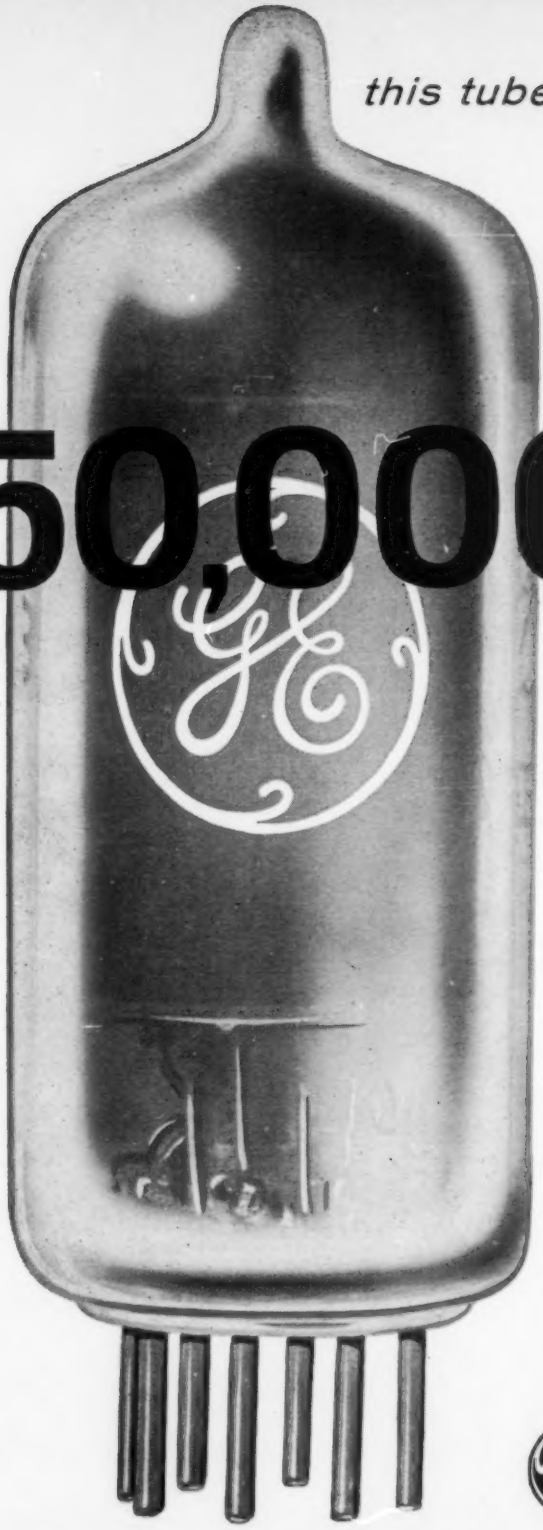
The other directors are: W. J. Thomas — managing director, British Aluminium Ltd., London, England; W. J. Bennett, executive vice-president, Canadian British Aluminium Co. Ltd., Montreal, formerly president of Atomic Energy of Canada Ltd.; B. B. Gralow, vice-president, Ontario Paper Co. Ltd., Thorold, Ontario; J. R. Philips, vice-president, Phillips Electrical Co. Ltd., Brockville; J. Ritchie, financial director, British Aluminium Co. Ltd., London, England; E. H. McCann, Phillips Electrical Co. Ltd., Brockville.

New principals for Computing Devices

Computing Devices of Canada Ltd., Ottawa, has signed an agreement with the Clary Corp. to handle their digital computing equipment in Canada. They will also handle the Clary print-punch equipment for office and industrial automation, and the business control system for retailers.

An exclusive agency representation agreement was signed with Microdyne of Chicago, manufacturer of a precision vacuum tube volt meter inverter.

(Continued on page 48)



this tube has a police record

G-E FIVE-STAR RECEIVING TUBE RETIRED AFTER 50,000 hours CONTINUOUS OPERATION

In September 1952, a G.E. 5654 receiving tube, the Five-Star version of the 6AK5, was installed in a repeater station of a province-wide police radio network. In June, 1958, after nearly 6 years of continuous service, it was still operating efficiently but was replaced as a precautionary measure.

The outstanding performance of this tube is positive proof of the high-reliability and long life qualities inherent in all G.E. Five-Star receiving tubes.

G.E. Five-Star receiving tubes are advanced-designed and made in Canada to fill the special needs of Canadian manufacturers of military and industrial electronic equipment. They meet the most exacting demands of airborne and mobile installations, where ultra-reliability is vitally important in maintaining critical radio communication under unusual and severe operating conditions.

For up-to-date details on the availability and new low prices of Canadian-made, high-reliability 5-Star receiving tubes contact: Electronic Tube Section, Canadian General Electric Co., Ltd., 189 Dufferin Street, Toronto, Ontario.

GENERAL ELECTRIC
INDUSTRIAL AND MILITARY TUBES

Electronic Tube Section

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CANADIAN GENERAL ELECTRIC COMPANY LIMITED

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TV Star Joan Fairfax gets acquainted

Canada Wire television cables

CANADA WIRE CW-TELCON cables are star performers throughout the complex systems that faithfully transmit audio and video impulses from studio to home receivers. One reason is that these Canada Wire products are "swept" to ensure the absolutely uniform diameters necessary for perfect response to all frequencies.

To Canada's television *and* radio industries, Canada Wire supplies all types of conductors, including; coaxial cables, dual coaxial cables, triaxial cables, air spaced coaxial cables, helical membrane cables and antenna lead-in wire. Where special cables are required, Canada Wire—as one of Canada's largest and most experienced manufacturers of electrical conductors—is uniquely well-equipped to provide the proper cable for the particular application.

CW-Telcon RF Cables Catalogue No. CWT-57 will be forwarded to you on request.

QUALITY CABLE IS LOW COST CABLE!

Canada Wire and Cable Company Limited

A Canadian Company Manufacturing and Selling Coast to Coast

with some other television stars

with Polyethylene dielectrics

"UNION CARBIDE" POLYETHYLENE is a star performer as the dielectric in Canada Wire CW-TELCON RF CABLES because of its extraordinary chemical, electrical and physical properties with such outstanding advantages as low power factor, high resistance to moisture, acids and alkalis, stability in the presence of ozone, excellent resistivity and dielectric strength.

Pioneers in the extrusion of polyethylene for RF cables in the Western Hemisphere, Canada Wire also uses "UNION CARBIDE" polyethylene as a jacketing compound because of its good temperature properties . . . −76°F to 176°F.

To find out more about why "UNION CARBIDE" polyethylene is the *preferred* material for the dielectrics and the jackets of wires and cables for submarine, underground or above ground installation, contact our nearest sales office.

UNION CARBIDE TRADE MARK **POLYETHYLENE**

CARBIDE CHEMICALS COMPANY
Division of Union Carbide Canada Limited
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Components
Compression Tooling

PLUG and RECEPTACLE CONNECTORS

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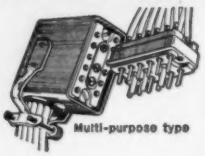
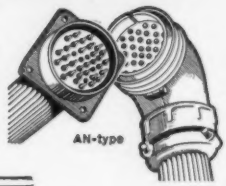
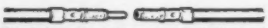


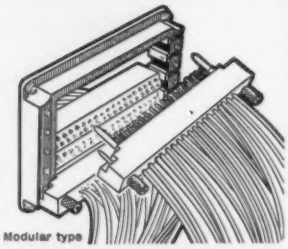
Multi-purpose type



AN-type



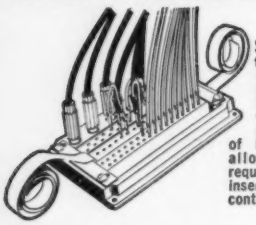
With Crimp-type, Snap-Locked Contacts

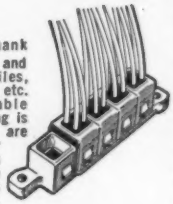


Feed-through, Modular type

HYFEN*— Crimp-type connectors permit the design of lighter, more compact equipment. Contacts can be removed, re-inserted or replaced. Designed to replace, or mate with virtually all existing connectors, the HYFEN meets or exceeds MIL specs. Reliability-tested crimping saves time and ends the high rejection rate inherent with solder.

TAPER PIN PANELS





STAPIN*—Solid shank taper-pin contacts and panels for missiles, control equipment, etc. Especially valuable where circuit testing is required. Contacts are of high-quality copper alloy and plated as required. An impact-type insertion tube installs contacts into the panel.

COMPRESSION SHEATH CONNECTORS

For Shielded or Coaxial Cable

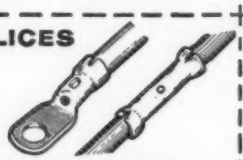
UNIRING*— One-piece connector for grounding, joining or terminating. Inner ring slides under shielded braid while tap wire is held between braid and outer ring. Accommodates single or multiple taps. Available with nylon insulation or uninsulated.

HYRINGs*—Two-piece inner and outer ferrules, color-coded. The small HYRING is slipped under the braided shield and the larger, HYRING is slipped over the shield and ground leads. A single crimp completes the assembly. Outer ferrule available pre-insulated.

TERMINALS, LUGS, SPLICES

INSULUG*—Color-coded, nylon insulated lugs. Also spade or fork-tongue design, or banded for automatic machines.

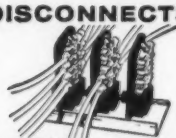
SEALINK*—Nylon insulated, water-sealed, one-piece splice for single or multi-cable. Anodized aluminum sealing rings. Takes AN 26 thru 10.



HYLUG*& HYLINK*—Compact, one-piece, pure electrolytic copper. Electro-tin plated to prevent corrosion. With or without insulation grip. Inspection holes for simple check of wire insertion.

PANELS and DISCONNECTS

UNILOK*—Single or gang disconnect, pressure or non-pressure applications. Seamless, crimp-type, removable contacts with maximum mechanical, electrical efficiency.

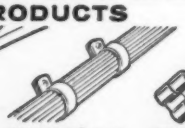


MODULOK*— Terminal block with snap-in, spring-loaded contact and separable modules. Either quick-disconnect or permanent block. 30 modules (2 or 4 tier) per ft.

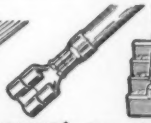
PANELOK*— Pressure-tight, molded panels with nylon insulated or uninsulated, silver-plated HYPIN* sockets. Connect, disconnect from either side of bulkhead without removing panel.

OTHER PRODUCTS

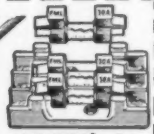
BURCAP*—Nylon-insulated, crimped splice for wide range of wire combinations. Electrolytic copper for maximum conductivity.



NYLOCLIP*—Molded nylon, lightweight, cable hanger. Resists temperatures from −60° to 250°F. 17 sizes for cable, bundles ⅛" to over 2".



FINGRIP*— Inexpensive, reliable quick-disconnect terminals. Male, female, right angle variations. Install with automatic machine or simple hand tools.



LIMITERS*— Protect aircraft systems against high overloads, shorts. Visual or mechanical indicating type. 400 c, 115/208 v AC, DC up to 30 v.

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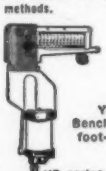

YD series
Cartridge-fed, semi-automatic

Y10NCP*
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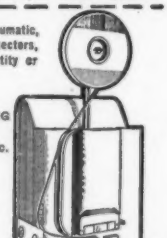

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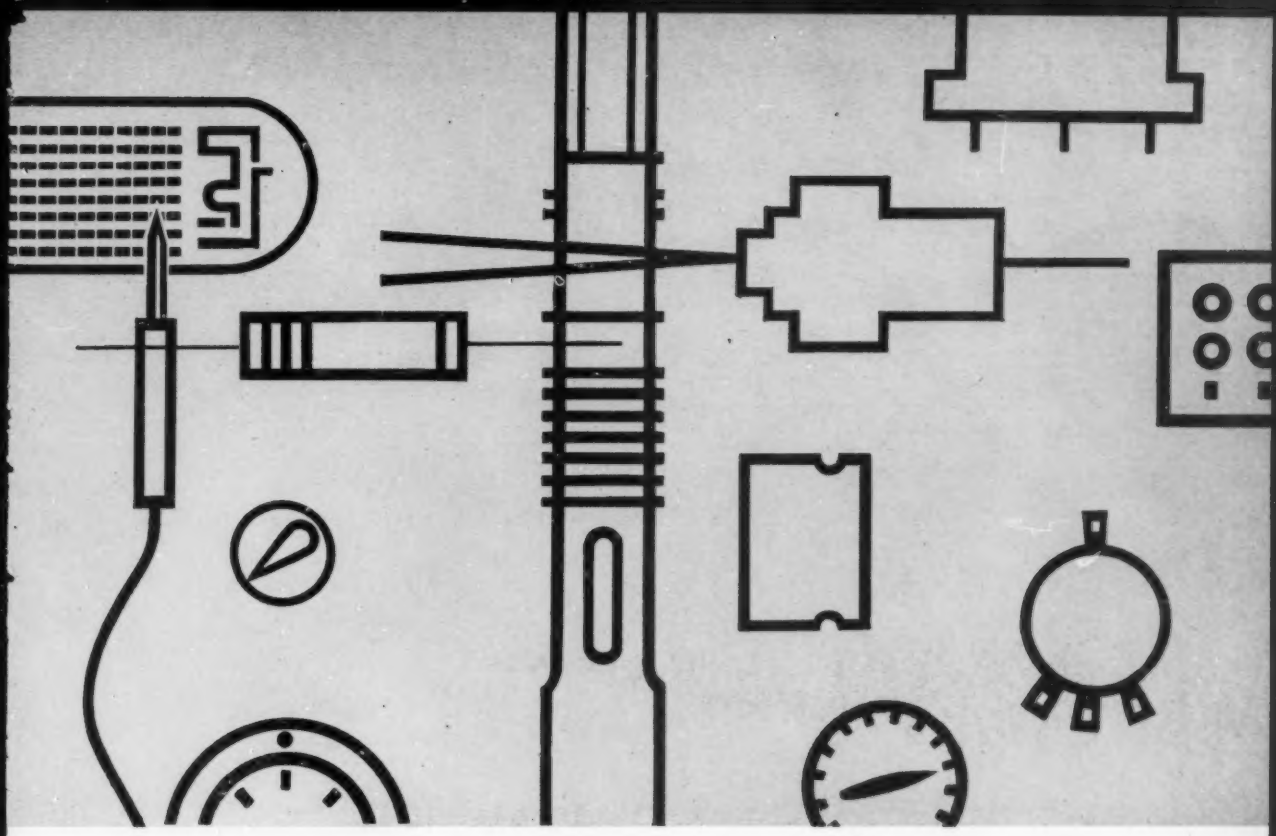

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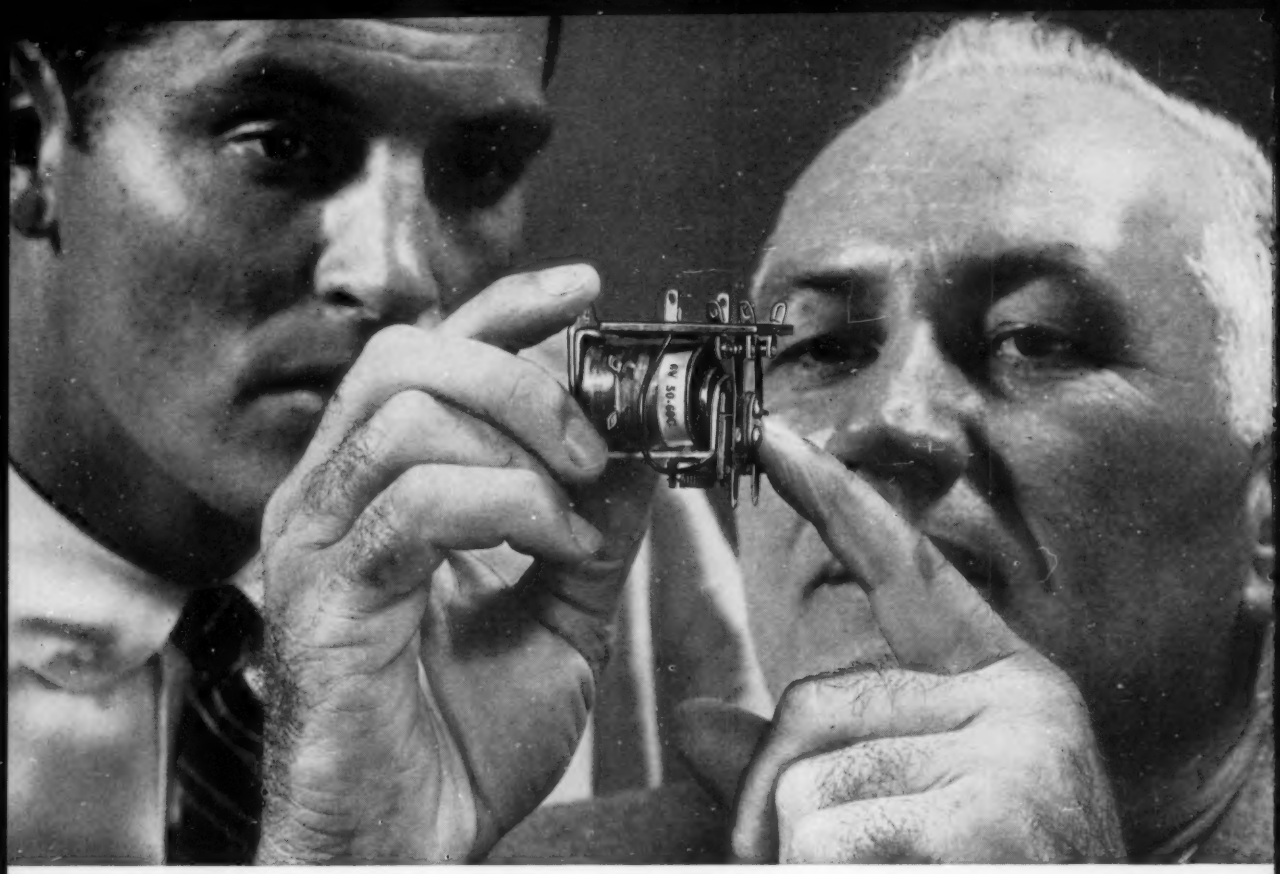

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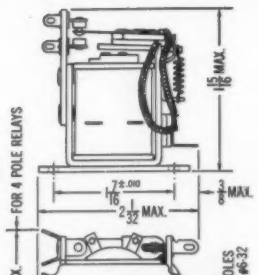

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GENERAL: Breakdown Voltage: 500 volt rms, 60 cycle between all elements standard 4 pole relay; 1500 volts rms, 60 cycle on special 3 pdt relay.

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Power: 100 milliwatts per movable arm.

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Voltages: up to 110 volts dc. up to 230 volts ac.

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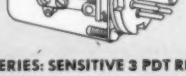

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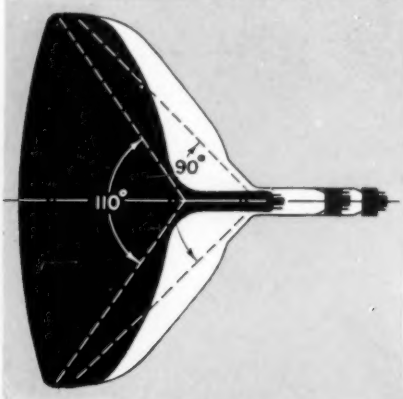

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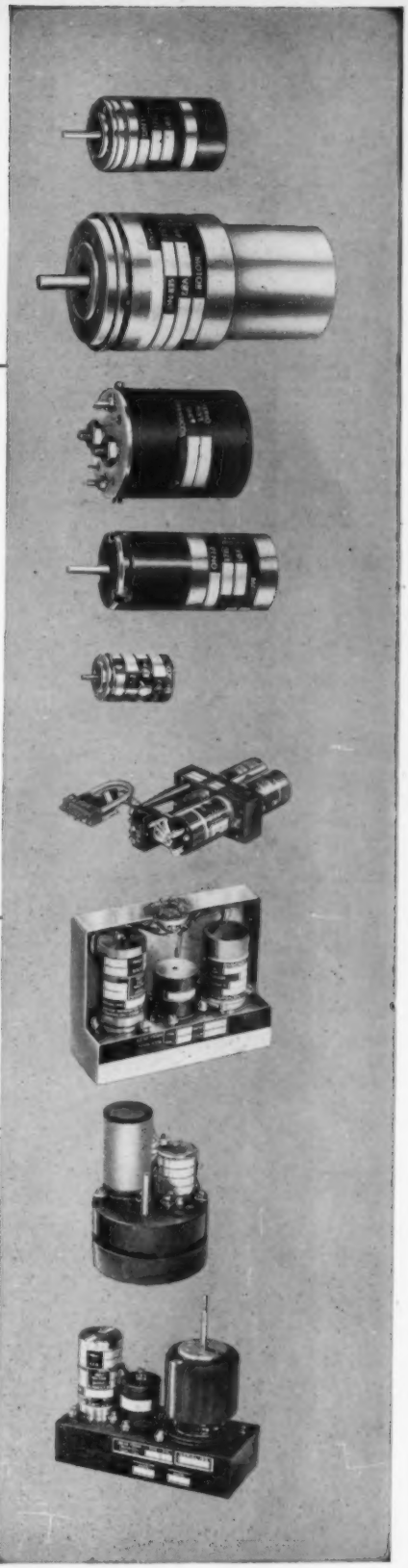

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CANADIAN
ELECTRONICS
ENGINEERING

Patents suit harms relations with U.S.A.

Last month Washington aimed a nasty blow at the Canadian electronics industry. The U. S. Department of Justice filed an anti-trust suit against General Electric Co., Westinghouse Corp. and N. V. Philips Gloeilampenfabrieken. Eight Canadian companies, including Canadian Radio Patents Ltd., have been charged as co-conspirators. Essentially, the suit is an attempt to prove that the operation of Canadian Radio Patents Ltd. is illegal under the Sherman Antitrust Act in that it has restricted the free flow of U. S. radio and television receivers into Canada.

The insidious aspect of the suit is that action has been taken against the parent companies because of things being done by their Canadian subsidiaries. And all this time the Canadian companies have been operating legally within the framework of Canadian law.

This is nothing more than a barefaced attempt to increase the size of the big stick wielded by Washington. Attorney-General Roberts professes to be acting in the best interests of the people by prohibiting trade-restricting monopolies within the electronics industry. Canadians will derive small comfort from the fact that he is indeed acting in the best interests of the people — the American people, by trying to create a larger monopoly for American industry.

We cannot tolerate this invasion of our sovereignty, this attempt to force the will of a few Americans upon all the Canadian people. The Canadian Government and the electronics industry must work together to take a firm, sensible and reasonable stand on the issue.

We owe a great deal of thanks to the American people for their help in developing the resources of Canada. But make no mistake; they have helped because they could derive some benefit from so doing. And we accepted their help because we could derive some benefit. This is reasonable. In fact, it is very sensible. We can and must work in harmony with our neighbors to the south, but it must be with mutual respect.

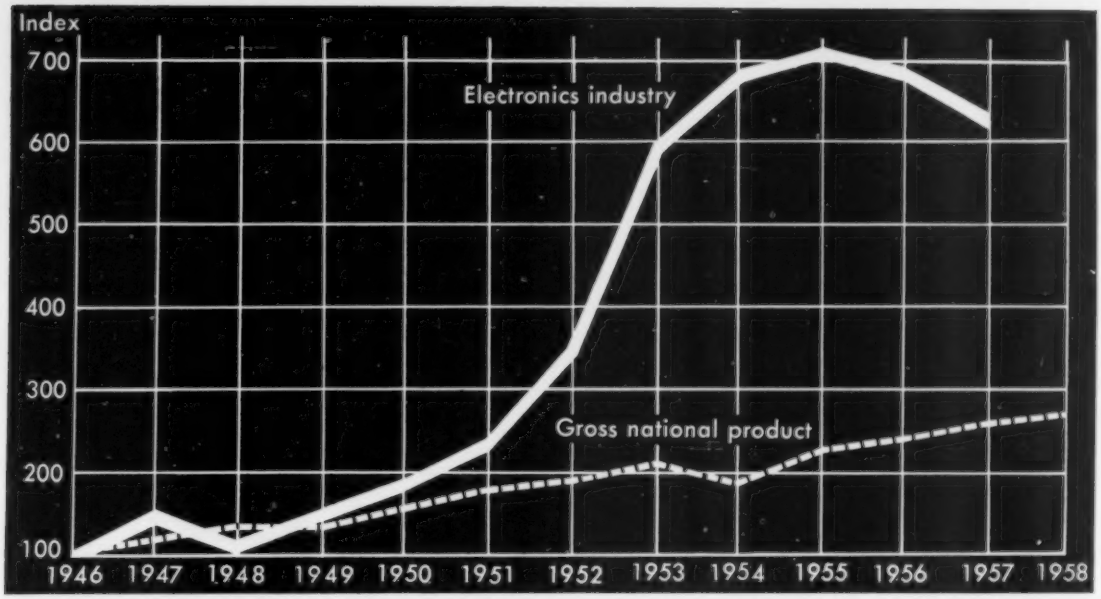
Let's stop this pussy-footing around, and jabbing below the belt. Let the industries of the respective countries present their briefs to their governments; and then let the governments sit down to do some real, above-board bargaining. This will go a long way toward regaining some of the mutual respect recently lost.

THE EDITOR

Special report

INDUSTRY REVIEW & FORECAST 1958-1959

Contents



Growth of the Canadian electronics industry in relation to gross national product. Index: 1946-100. Source: EIA

Where do we stand?

Last January it looked as if the Canadian electronics industry was still on the "plateau" of a growth curve which had shown a seven-fold increase in dollar sales volume in seven years. But when the final figures for 1957 became available — see table below — it was clear that we had gone "over the top."

Significant decreases in sales of television receivers and of defense electronic equipment — both about 23% down from 1956 levels — more than offset increases in other areas. As a result the total activity failed to reach $500 million for the first time in three years.

Complete information on 1958 is, of course, not yet compiled. There are, however, strong indications that the total will again be down.

Television receivers, radio receivers and record players together account for almost half of the industry's sales dollar. They were all down from 1957 at the end of October, the drops in sales varying from 6½% for radio receivers to 13½% for record players.

In the case of defense electronics, we can again expect the total to have fallen. Termination of the two major electronics contracts associated with the CF-105 aircraft has certainly affected matters. However, the cancellations were made fairly late in the year and will have been balanced to some extent by the placing of contracts for alternative work.

Further details and opinions on these and other aspects of the industry are given in the following pages.

Electronics in Canada

Actual and estimated sales for 1956 and 1957

	1956	1957
Television receivers	$184,000,000	$141,000,000
Radio receivers	55,000,000	58,000,000
Record players	13,000,000	18,500,000
Defense	130,000,000	99,000,000
Broadcast, General communications, etc.*	27,000,000	32,000,000
Replacement parts, Components, Tubes, and Services*	100,000,000	120,000,000
TOTAL	$509,000,000	$468,500,000

*Estimated

Sources: EIA and DDP

MILNE STUDIOS

Electronics vital, overall prospect is bright

In this special statement to Canadian Electronics Engineering, R. M. Robinson, P.Eng. reviews the current status of the industry and stresses the importance of research to our future prosperity. Mr. Robinson is president of the Electronic Industries Association of Canada and vice-president and general manager, Electronic Equipment and Tube Department, Canadian General Electric Company Ltd., Toronto

A year ago this month the three-millionth television receiver manufactured in Canada was sold and, since that time, nearly half a million additional sets have been put into the hands of Canadian consumers. Although sales of television receivers have been slightly lower in 1958 than in the year before, they exceeded our expectations. In a similar manner, radio receiver sales, although slightly lower than 1957, have become firmly steady.

Record player sales are expected to rise under the influence of high fidelity and stereophonic sound. With the possibility of stereophonic multiplex broadcasting in the fairly near future, the outlook for both radio and record players is bright.

Radio imports high

The radio receiver sales picture has been darkened over the past year or so by the threat due to importation. This is very serious. During the first seven months of 1958 27.4% of all radio receiver sales in Canada were imported. With a total current market of around 700,000 units a year such a percentage arising from imports cuts seriously into Canadian production and employment. There is no doubt that this has also had its effect upon the components manufacturers and has altogether created a situation detrimental to the Canadian electronics industry.

With the creation of the new Board of Broadcast Governors it is hoped that second television stations will be opened in 1959 in key cities and towns across Canada. This will have a stimulating effect upon the manufacturers of transmitters and other studio equipment and will also have a good effect upon the sale of second television sets in the already well-established viewing areas.

The cancellation of the Astra and Sparrow II programs in the defense business was a very serious blow to the electronics industry. Some of our members were very seriously affected. While the immediate future is not too bright, all is not lost. The industry, through its Government Liaison Committee working in conjunction with officials of Department of Defence Production, is making determined efforts to secure its fair share of the electronics portion of the integrated North American Defense Program weapons contracts.

Industrial electronics grows

The field of industrial electronics has been steadily widening in scope and character. This has been indicated by the very great increase in the membership of the EIA Electronics Division — from twenty-odd members to thirty-three at the present time over the past three years. This indicates the growth and interest in industrial electronics and clearly shows the progress being made in applying electronic control to industrial processes and in business applications.

Research and development still comprise the springboard of the industry. The importance of research and development cannot be over-emphasized, especially in an industry such as ours where the art and science is forever developing at a faster pace. Both fundamental and applied research programs must be a continuing process because the very life of the industry depends upon new sources of knowledge and its application. Research is of a long-term nature. At least five years of work and substantial financial outlay must be spent on a well-planned research program before any return on investment can be expected. However, these financial outlays must be made in order to provide for the future of the industry and for other industries which are becoming more and more affected by the products manufactured by the electronics industry.

Although we have had many problems in the past year, the long-term view is bright. Electronics is playing a vital part in all our lives, and this trend is bound to continue in the future, particularly when our research and development programs develop products and equipment for production line manufacture. Although the picture is clouded in some corners, the over-all view is optimistic.

What's ahead for electronics?

GENERAL OUTLOOK

After the third successive year in which total sales appear to have fallen, while imports still maintained a fairly high level, the Canadian electronics industry faces a tough 12 months. Immediate prospects for 1959 include a hard selling job and the need to plow back an increasing proportion of profits into research, development, and facilities to meet the challenge of the years ahead.

Home entertainment

Advent of second stations in key cities and installation of satellite transmitters may aid an otherwise difficult market for television receivers. FM, and possibly stereo broadcasting, together with growth of portable and clock radio sales should give a reasonable year for radio receivers. Record player prospects will probably relate more directly to surplus spending power, with the accent on the lower and medium priced units. Design, quality and service will be important.

Defense electronics

The Canadian government and the industry will both have to work hard if an integrated production program is to be launched in 1959 in the face of strong U.S. political and industrial influences. SAGE computers and communications, and ground radars are the most immediate prospects. In the meantime, our loss of scientific and engineering manpower may be more than is expected in some quarters. There is a lot to be done in research.

Broadcast equipment

Continuing expansion of CBC radio networks, particularly to remote communities in the north, should lead to some good orders. Also look for an increase in fm transmitters and modernization of facilities in existing am stations. New TV station orders may be on the books within the year and there are good prospects for low-power relay transmitters. The whole range of broadcast and studio equipment is one of Canada's brightest export prospects.

Computers data-processing

New business applications will continue to arise, ranging from the use of smaller units on payroll and similar accounting tasks to complex arrangements of computers and peripheral equipment such as the recent installation by Ontario Hydro. Military applications range from SAGE and the processing of battlefield intelligence to small analogue units for the solution of navigational problems. Many industrial control applications remain to be explored.

Industrial applications

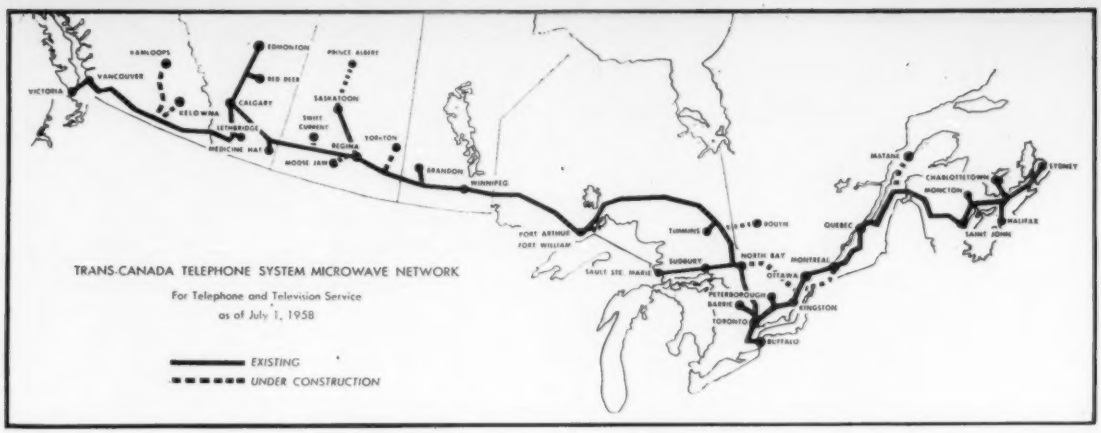
This field is as broad as the electronics industry itself, the main areas being in controls, instrumentation and communications. Basic industries such as chemicals, rubber, pulp and paper, petroleum products and food processing all provide good prospects. Developments leading to lower power consumption and greater reliability will reap their dividends. More traffic control devices and new applications of industrial television will soon be needed.

Communications

Outlook for mobile communications equipment manufacturers is fairly bright. Although new licenses in 1958 did not reach the 7,000 forecast, there still was an increase over 1957. Many applications exist for low-power, cheaper-priced units, but standards must be maintained in other areas. Further expansion in remote areas will lead to new applications for microwave and tropo-scatter. Submarine cables and associated equipment should not be overlooked.

Research and development

This may well be described as the key to the industry's future. Almost all electronic research in Canada today is being done in government establishments and the universities. Industry must invest more in its own future in the development of new commercial products, and take an increasing share in defense research in the anti-missile, anti-submarine and tactical communications areas. Close co-operation with the Services will be essential.



Despite some problems . . .

The industry made real progress in 1958

The Canadian electronics industry suffered a severe blow when the government decided to cancel the Astra and Sparrow programs last September. It came with little warning and caught many companies completely off base. (The government had called for tenders in August on a building at Malton, Ontario, to house the Astra production and testing facilities of RCA Victor Co. Ltd.) It still is too early to assess the final damage that has been, and still is being done by such a large cancellation.

Despite this, the industry has made some real progress in many areas of electronics. These are a few of the significant developments and changes that took place in 1958.

Microwave spans Canada

On July 1, 1958, Canada became linked from coast to coast by a communications "skyway" known as the Trans-Canada Radio Relay System. Built by seven of the eight major telephone organizations which comprise the Trans-Canada Telephone System, it is designed to carry large quantities of high-grade telephone circuits and network television from Sydney, N.S., to Victoria, B.C. This represents a distance of 3,800 miles—making it the longest of its kind in the world—and several hundred additional miles of spur line has been or is now being built to connect other major Canadian centres of population with the main or backbone facility.

This dual role of telephone and television service for the nation was accomplished through the installation of a TD-2 System, which is especially suitable for broadband multi-channel facilities. Operating in the 4,000 mc band, this TD-2 system has a capacity for six radio channels in each direction. A single channel is able to handle 600 telephone circuits or a black and white or color video signal.

The TD-2 system has cost approximately $50,000,000 and comprises 139 relay stations on the main coast-to-coast line. In addition there are over 30 more relay stations for the spur lines.

Canadian Pacific Communications and Canadian National Telegraphs jointly provide television transmission to French network points in Quebec and to cities in southwestern Ontario.

Newfoundland will be linked to the microwave network this year when Canadian National Telegraphs completes the 70-mile hop across Cabot Strait.

In June, Goose Bay, and other communities in Labrador were connected to Quebec City by a combination of microwave and tropospheric scatter equipment. These communities now have, for the first time, regular commercial long distance telephone service over a system which is capable of providing up to 200 channels of telephone circuits.

The installation was undertaken by Northern Electric Co. Ltd. for the Bell Telephone Co. of Canada and Quebec-Telephone.

Customer direct distance dialing (DDD) was started in the Toronto area last May and is being extended to other areas served by the Bell Telephone Co. in Canada. This is part of the over-all North American system in which the U. S. A. and Canada have been divided into more than 100 areas to make each phone number unique.

Saskatchewan Government Telephones has taken its first step toward DDD with installation of tandem crossbar equipment at Regina. At the present time this gives them operator distance dialing. Alberta Government Telephones is making similar preparations.

Radar lines need upgrading

Advances in the design of missiles and manned aircraft have posed a bit of a problem for the radar lines across Northern Canada. In fact, recent news of the Russian nuclear bomber changed the defense picture quite drastically. The minimum action that can be taken is to upgrade the present equipment and supplement it with some new equipment.

One large order for new height-finding radar sets went to Canadian General Electric Co. Ltd. The unclassified contract awarded by the Department of Defence Production was valued at $3,488,479.

Computers will find wider use

After several years as a laboratory or special purpose instrument, the computer has begun to come into its own in the business world. Companies are showing increased interest as the machines are improved technically, sim-

1958-59 EIA Executive

Standing L-R: J. D. Houlding, vice-chairman, Electronics Div.; R. A. Hackbusch, Director of Engineering. Seated L-R: E. Leaver, v-p & chairman, Electronics Div.; W. H. Jeffery, past president; R. M. Robinson, president; S. D. Brownlee, v-p & chairman, Receiver Div.; James Key, v-p & chairman, Components Div. Other members: F. W. Radcliffe, gen. mgr. & sec.; D. Knapp, vice-chairman, Components Div.; W. F. Wansbrough, vice-chairman, Receiver Div.

PHOTO COURTESY RTA SALES & SERVICE

plified operationally, and made more competitive economically due to rising wage rates.

Insurance companies have been among the leaders in the use of large-scale electronic data processing systems. Now, the Hydro Electric Power Commission of Ontario has taken the lead among electrical utilities with its integrated province-wide system. Based on a Remington-Rand Univac II computer, the system eventually will be connected to nine regional offices and more than 100 rural offices throughout Ontario.

Accounting, or other information can be received from the various offices by land lines, then processed at the Commission's head office in Toronto. The engineering departments will have access to machine time for work on design problems.

In the area of special purpose computers and simulators, Canadian Aviation Electronics Ltd. received a $2,048,435 order from D.D.P. for the production of general purpose flight and instrument trainers for the RCAF's twin reciprocating engine aircraft.

CAE also has announced that it is engaged in a project to design and manufacture an operational flight trainer for Canadair's giant CL-28 Argus submarine hunter, and make a design study for a tactical procedure trainer related to the CL-28's complex radar and weapons system.

CAE has previously manufactured flight simulators for the CF-100 and the DC-6B passenger airliner operated by Canadian Pacific Airlines.

Two million dollars worth of Western Union telegraph equipment has been put into operation in Montreal by Canadian National Telegraphs.

Known as a reperforator switching system, the new centre can handle 82,000 messages per day to and from all parts of the world. It has a direct-line hook-up with every CNT office in Quebec and 120 telegraph offices at major points across Canada. Direct connections also link it with the Western Union network in the United States.

The centre receives messages from local offices at the rate of 60 words per minute. The operator then switches them to the appropriate destination circuit where they are despatched at 120 words per minute.

Canadian navigator is good

Military electronics may be suffering in competition with the American companies, but there is every indication that Canadians can hold their own on the commercial market. Pan American World Airways, the world's largest international airline, has placed orders with Canadian Marconi Co. for doppler radar navigation equipment for its jet airliners. The equipment, based upon circuits developed by scientists at Defence Research Board, is entirely self-contained. It operates without the aid of ground stations in providing the pilot with information on his true ground speed and distance traveled from take-off.

Canadian-designed and built tropospheric scatter equipment is continuing to attract attention from prospective buyers in other countries. Canadian Westinghouse Company is enjoying considerable success in selling its 4,400-5,000 mc Microscatter equipment to the U.S.A.F.. At the present time they are producing a standard version for use in the establishment and testing of ground control for the Bomarc missile, and a tactical system with 48-voice channel capacity.

Another Canadian product being sold abroad is the airborne profile recorder (APR) designed and built by Canadian Applied Research Ltd. The recorder has been adopted as standard equipment in the Lockheed RC-130 aircraft carrying out the new USAF program of bringing the world's geography up to date. Fifteen such aircraft will be used in the mapping program.

The APR combines a radar altimeter with an accurate pressure altimeter to measure terrain profile from elevations up to 35,000 feet with an accuracy of ± 10 feet.

Electronics has played a leading role in a major breakthrough in the science of aerial mapping. The automatic scanning correlator (Auscor) combines electronics and electro-mechanisms to scan stereo pairs and plot relative heights of image detail in aerial mapping. Results to date have been comparable with skilled human operators except that Auscor is faster and is free from the human fatigue factor.

Auscor was developed by G. L. Hobrough and his associates at Photographic Survey Corporation, Toronto.

In the consumer products field the big news is stereo records. Stereo tapes have been too expensive for the general public, but the new discs have caught on quite well. As a result, most of the manufacturers have brought out stereo record players, or designed their new lines so that they could be converted to stereo quite easily.

At least two companies now are pressing stereo discs in Canada. They are RCA Victor Co. Ltd., and Spartan of Canada Ltd. These utilize the Westrex 45/45 system and are compatible with monaural systems.

Electronic Industries Association

In recognition of the broadening spheres of activity, the Radio-Electronics-Television Manufacturers Association of Canada has changed its name to Electronic Industries Association of Canada. This change was officially adopted at the 29th annual meeting last June.

An item of great concern to EIA in 1958 was the

(Continued on page 39)

Consumer products

Home entertainment market hardens

The consumer products segment of the Canadian electronics industry, comprising the manufacturers of domestic radio and television receivers and record players, were responsible for almost exactly half of the industry's total sales in 1956, the combined value being $252 million. In 1957, the corresponding figure was down to $217½ million. This was due to a continuation in the decline in television receiver sales from the peak year of 1955, which more than offset an encouraging, but slight increase in radio and record player sales.

The picture for 1958, with complete figures for the first ten months available, is unfortunately not so bright. As of the end of October, sales of all three products were lower than in the corresponding period in 1957. The possibility of the deficit having been recovered by pre-Christmas purchasing during November and December seems fairly remote.

We are thus faced with a market which has hardened considerably. There are some indications of areas of improvement in 1959, but the industry will have a tough job to restore an upward trend within the year.

Quality control is very important in tv manufacture. Here a technician double-checks parts before the chassis is installed in the cabinet. (Photo courtesy Canadian Westinghouse)

Television receivers

Recent trends in producers' domestic sales of television receivers are illustrated in the upper part of the chart opposite, which is based on data compiled by the Dominion Bureau of Statistics. Although sales were higher in several months of 1958 than in the corresponding months of 1957, a fall-off in August, September and October resulted in a reduced total for the ten-month period.

Prime reasons for the decline continue to be the high degree of saturation of the market and the absence of any significant replacement sales to date. Seventy-two percent of wired homes within effective program range had tv a year ago, and about 450,000 sets have been sold since then. Small new markets are opened up as satellite stations are commissioned, but the brightest prospect is that of second vhf stations in major centres such as Toronto and Montreal. It is doubtful, however, whether any of these will be on the air soon enough to affect this year's sales.

With the average receiver age still only about four years, certainly less than the reasonable life-expectancy of a typical set, the potential replacement sales in 1959 cannot be regarded as a major solution to the problem. This type of sale is bound to increase, as will the sale of second sets to households that already have tv, but neither will probably be really significant until 1960-61.

Again, the prospect of color tv broadcasting in Canada seems fairly remote. One authority has suggested that some fundamental changes in programming will be necessary, leading to the introduction of more shows that could be greatly enhanced by the addition of color.

The main hope of the manufacturers must lie in the continued incorporation of design improvements and innovations, and the accenting of quality and service in the sales approach. Both have served the radio industry well.

Radio receivers

Sales of radio sets in the first ten months of 1958 were only about 6½% below the 1957 level. The total for the year will therefore be close to 700,000 units (1957—722,000).

Some explanation of the reduction can be found in the number of sets being imported—more than one quarter of all the sets sold in Canada during the first seven months of last year. Many of these receivers are coming from the U. S., but there is also a serious threat in the form of cheap transistor sets imported from Japan.

On the brighter side are the increasing sales of Canadian-made portables and the growing interest in fm. The latter seems to be enjoying a boom in the U. S. at present, and this should be further encouraged when stereophonic broadcasting is started.

A reasonably good year can therefore be expected for radio receiver sales, provided that the public can be persuaded to "Buy Canadian."

Record players

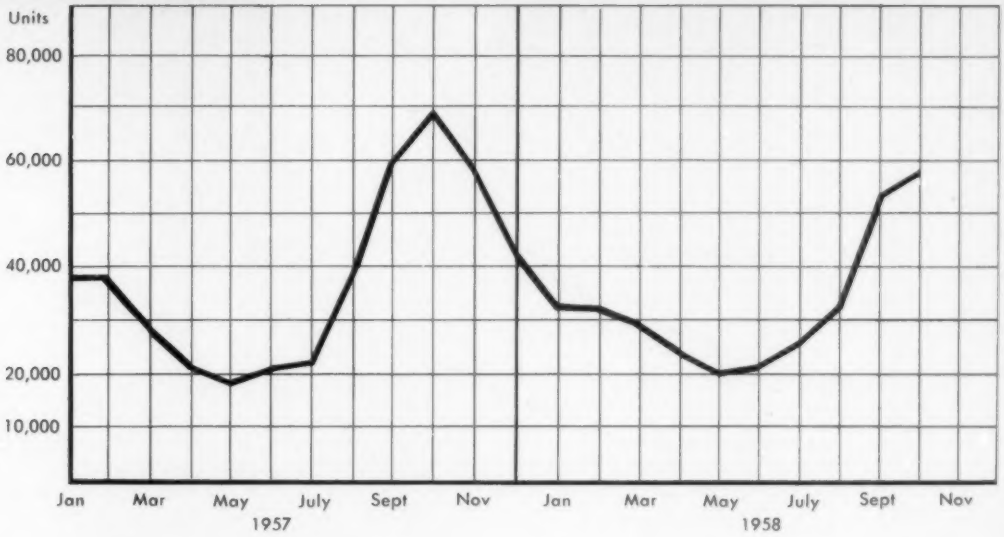
The expected boom with the introduction of stereo high-fidelity units and discs has not materialized. The DBS figures charted opposite give a total to the end of October of only 152,000 units compared to 175,000 in 1957, a drop of over 13%.

Here again imports, particularly from the U. S., have been steadily rising, reaching almost $1.7 million worth in 1957 and over $900,000 in the first six months of 1958.

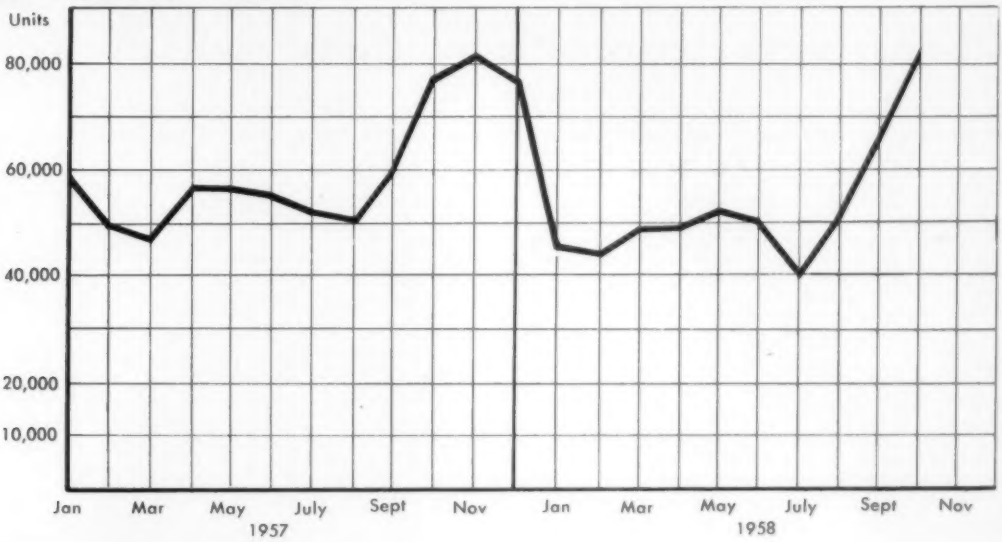
One reason for the decline could be that the consumer is regarding a record player—as compared to a radio or television receiver—as a luxury item. Thus, having equipped himself with radio and tv, his dollars are now being spent on other durables such as white goods, furniture, etc.

Whatever the reason, 1959 looks like being a fairly tough year, with the manufacturers having to keep prices as reasonable as possible so as to persuade the potential customer to buy Canadian if he is going to buy at all.

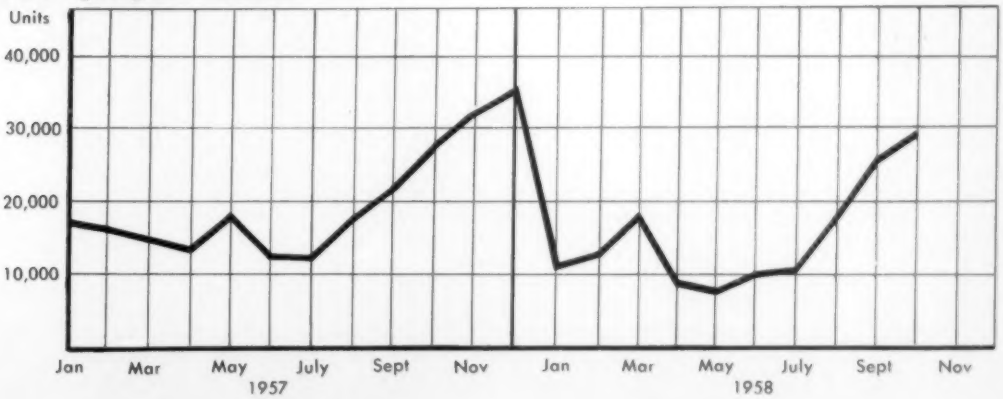
TV receiver sales

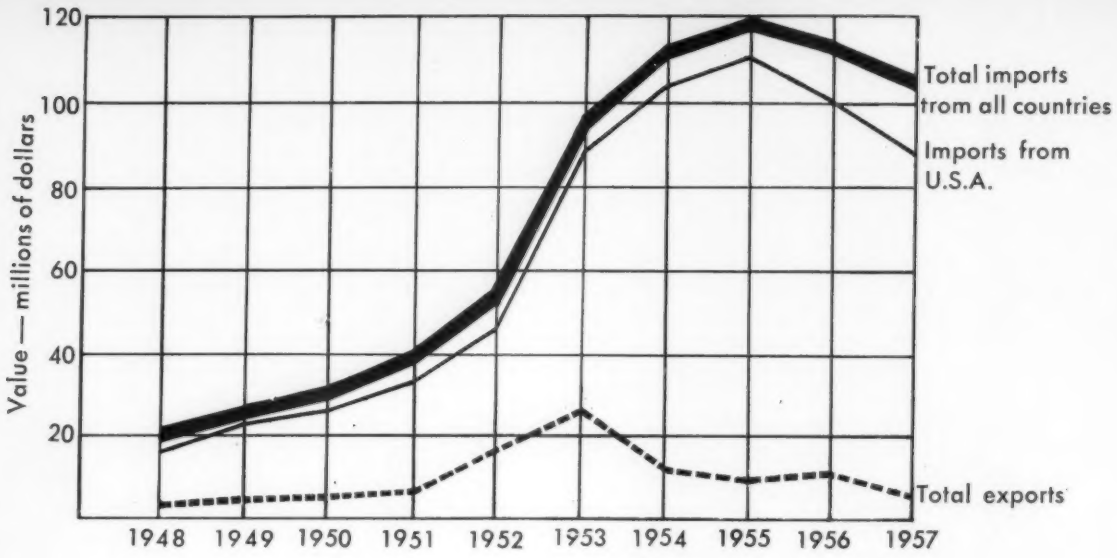


Radio receiver sales



Record player sales





Electronic imports maintain high level

Canada buys over $100 million worth — sells less than $10 million

Following a growth curve remarkably like that of the Canadian electronics industry itself, Canada's imports of electronic components and equipment increased five-fold from 1948 to 1957, the latest year for which complete figures are available. They reached a high value of $120 million in 1955, the year in which our own industry also reached its peak of activity. Canada's largest supplier, the United States, has lost some of its share of our market to other countries, notably the United Kingdom, but is still providing about 85 percent of all the electronic products we buy outside our own country.

Over the same period, our electronic exports have only grown from $3.3 million in 1948 to $7.4 million in 1957. They did, however, reach a peak of nearly $28 million in 1953.

The chart above is based on data provided by the Dominion Bureau of Statistics. The product groups included in the import totals are as follows:

Batteries and parts; dictating and transcribing machines and parts; tape recorders and parts; hearing-aids and electronic ear-training equipment and parts; phonographs and parts; radio and television receivers and parts; radio tubes and parts; sound equipment, including public address systems and parts, tape or wire for the recording or reproduction of sound, and records for use in broadcasting; other radio and wireless apparatus and parts; articles used in the manufacture of apparatus using radio tubes; precision electrical instruments and apparatus of a class or kind not made in Canada; and electric telegraph and telephone apparatus and parts.

Export figures include the following product groups: phonographs and parts; batteries and parts (not including storage batteries); radio receiving sets; radio and wireless apparatus; telegraph and telephone apparatus.

It should be noted that the figures for 1957 for both imports and exports are preliminary.

Since the bulk of our imports come from the United States, the table opposite has been prepared to give a clearer picture of the specific markets which U. S. manufacturers are currently penetrating. Based on reports of the U. S. Department of Commerce, it shows the total of their exports to Canada of various electronic commodities during the first nine months of 1958.

It should be noted that the figures shown are approximate, since they comprise the sum of the actual value of shipments of over $500 and an estimate for shipments valued between $100 and $499. In many cases, the total will be on the low side, since there were not sufficient low-valued shipments to Canada included in the sample taken to justify calculating an estimate for this country.

Classified products excluded

Another important point is that several major product groups are omitted from the list because the reports, for security reasons, do not give a breakdown of total exports from the U. S. by country of destination. These groups comprise:

Airborne, shipborne and land-type transmitters, receivers and transceivers, and specially fabricated parts and accessories; airborne direction finders, electronic detection and navigational apparatus, and specially fabricated parts and accessories; and electron tubes. This latter group includes all tubes not regarded as receiving types, such as klystrons, magnetrons, TR and ATR tubes, etc.

Canadian imports from U.S.A. during first nine months of 1958

Description	Thousands of dollars
Radio broadcast (am and fm) transmitters, transmission lines and antennas, including microwave studio-transmitter link equipment, and specially fabricated parts and accessories	417
Television broadcast transmitters, transmission lines and antennas, including microwave studio-transmitter link equipment, and specially fabricated parts and accessories	259
Radio and television broadcast audio equipment (including closed circuit), and specially fabricated parts and accessories	92
Television broadcast studio equipment (including closed circuit), and specially fabricated parts and accessories	239
Radio beacon (beam) transmitters, and specially fabricated parts and accessories	60
Automobile radio receivers (except communication receivers)	304
Radio-phonograph combinations with cabinets, combining phonograph with am radio or fm radio, not incorporating television	292
Other radios with cabinets, including am radios or fm radios, not incorporating television	1,049
Radio receiver chassis (without cabinets), not incorporating television	90
Television receivers with cabinets, with or without picture tubes or other tubes	983
Television reeceiver chassis (without cabinets), with or without picture tubes or other tubes	14
Receiving-type tubes	4,045
Television camera tubes (cathode-ray)	247
Television picture tubes (cathode-ray)	474
Other cathode-ray tubes	161
Parts and accessories, specially fabricated for electron tubes	1,193
Crystal diodes and transistors (semi-conductors)	880
Capacitors	1,652
Resistors	936
Inductors (including tranformers and coils)	650
Loud-speakers	381
Carrier current equipment (high-frequency wire transmitting and receiving apparatus), and specially fabricated parts and accessories	380
Amplifiers and amplifying systems, audio frequency, including public address systems, and specially fabricated parts and accessories	391
Amplifiers (except audio frequency), and specially fabricated parts and accessories	287
Recorders (disc, tape, and wire), and specially fabricated parts and accessories	2,732
Electronic equipment, not elsewhere classified, and specially fabricated parts and accessories, not elsewhere classified	10,662
Telegraph apparatus (wire), and specially fabricated parts and accessories	2,532
Telephone instruments	141
Telephone equipment (wire), and specially fabricated parts and accessories	5,981
TOTAL	37,524

How the men at the top see it

A forum of executive opinion on what's ahead for electronics


RAPID GRIP & BATTEN

W. H. JEFFERY, PEng

Vice-President and General Manager, Philco Corp. of Canada Ltd., Don Mills, Ont.

"... we must resist growth of imports..."

In 1958 the commercial end of the electronic industry had several highlights. The new breakthrough in stereophonic reproduction, the high degree of acceptance of transistor radios, and the new form factors in television receivers were a few that come to mind.

The most important feature of 1958 is the improvement in the profit position for those firms in the commercial electronic business. The continuation of this profit growth in 1959 is by no means assured. One of the most serious deterrents is the extremely rapid growth of foreign imports in both the high fidelity and transistor fields.

There is, unfortunately, a feeling of complacency in our industry that these problems will work themselves out, but unless each of us individually, and collectively, actively resists in every conceivable way the growth of these imports, our industry could be severely damaged.

Design improvements vital

On the brighter side for 1959, is the evidence that our industry realizes the importance of continuous design improvements in our products. Because of the limited market resulting from population increase, new family formations, and replacement, the key to continued volume sales in television particularly is in planned obsolescence which can be based soundly only on the addition of new features which our customers want.

1958 was a disappointing year for the government phase of the electronic industry. The cancellation of the Sparrow II and Astra programs has resulted in critical hardship. The best efforts from Ottawa have resulted only in "gap-filling" contracts designed to hold the bare nucleus of the engineering teams together. We must face the fact, however, that 1959 will be a very lean year insofar as defence contracts are concerned. The excellent work which D.D.P. is fostering in endeavoring to obtain U. S. contracts placed in Canada cannot possibly bear fruit in 1959. The industry will need all its strength to weather the storm and to retain its design, engineering and production strength for what will undoubtedly be a brighter long-range picture.

A. H. ZIMMERMAN, OBE

Chairman, Defence Research Board, Ottawa.

"... electronic research is the key ..."

It is abundantly evident that the field of electronics is one of the most fertile to be cultivated by the researcher. There are many phenomena yet to be understood and explained. It is a monumental task which must be shared by everyone who has competence in the field.

The ever-increasing speed of flight and the myriad applications of electronics have materially altered the whole basis of military planning, and will no doubt continue to do so for many years ahead.

Three complex problems

In attempting to assess the research requirements of the armed services for the future, three highly complex problems are evident: the air defence of North America; the submarine threat; the deployment and tactics of ground forces on the atomic battlefield. The common factor influencing defence in all of these areas is the power of the atom. It has created situations never before encountered in war, and hence created the need for research to acquire knowledge to apply to the development of defensive measures.

Defence against a ballistic missile, whether it is launched from points on land or from submarines, is primarily a problem of detection and guidance. This obviously is a task for the electronics engineer. Before he can build, he must have knowledge, and research is the only means of acquiring it for him.

The submarine is an even greater threat than in the past. Again the major problem is detection, which is to a very great degree dependent on the electronic engineer. The scientist must again be consulted for explanations of the phenomena which exist in the deep and shallow waters of the world's oceans.

New tactics for the land battle are being evolved because of the wider dispersions and the more urgent need of battlefield intelligence. Fast, accurate and secure communications are imperative. The inference is, of course, obvious.

Communications lifelines

In all these areas—air, sea and land—communications are the lifelines of the forces. Speed, accuracy and security are essential to the commanders in all echelons. Electronic research is the key to open the door of knowledge in this as in other fields.

There need be no doubts as to the wisdom of the electronics industry entering the research field. As stated earlier there is a monumental task to be performed and it must be shared among us all. The rewards from a soundly-based research program are many, not the least of which is the satisfaction of contributing to the defence of our country and the survival of its people.

MILNE STUDIOS

E. L. BUSHNELL

Vice-President, Canadian Broadcasting Corp., Ottawa.

"... extending service in the North ..."

During 1958 the Canadian Broadcasting Corporation completed construction of two major television studios in Montreal and Toronto, thus culminating three years of planning, engineering, construction and installation. The studios are the largest in CBC service and incorporate many unique features and equipment of CBC design.

The CBC television network (the longest in the world) went into full service on July 1. Network facilities are leased by the CBC from the communication companies to provide simultaneous television to three million homes through French and English stations in every province except Newfoundland. The television network is expected to extend to Newfoundland in a few months.

In order that television programs originating in Eastern Canada may be viewed at more suitable times in Western Canada, a Television Network Program Delay Centre was constructed in Calgary. Television network programs are recorded at the centre on video tapes for double replay to the mountain and Pacific time zones.

Satellite transmitters

Television coverage was extended in Nova Scotia when three low-power television transmitters, or "translators," were built at Liverpool, Shelburne and Yarmouth to relay programs from the CBC Halifax television station, CBHT.

In radio, planning was completed for the installation of 13 network-type low-power relay transmitters. Two of these transmitters are now in service.

The CBC commenced implementation of plans to transfer eight low-power community stations in the north from control by the Department of National Defence and local community groups to the CBC. There are plans to add two more stations in isolated communities to provide CBC programs to people in the north.

MILNE STUDIOS

S. D. BROWNLEE

Executive Vice-President, Canadian Admiral Corp. Ltd., Port Credit, Ont.

"...increase emphasis on quality ..."

The year of 1958 was the tenth anniversary of television sales in this country. Canadian tv set manufacturers can look back over the past decade of selling in Canada with considerable satisfaction. And there is no reason to expect the next ten years will be any less fruitful, despite the return of a normal market.

The present sales level of tv will be maintained and improved in 1959 because of increased obsolescence and age of sets in homes, more trade-in selling, and the addition of new features such as wireless remote controls, slimmer cabinet designs and improved picture tubes. In addition, the arrival of new competitive tv stations in single-station markets will open up new opportunities for second set sales in many heavily populated areas of the country.

Quality important

There must, and will be, increased emphasis on quality in production and selling. Consumers will want the greater dependability that a quality product offers and will be willing to pay a little extra for it. Retailers will find quality products offer better profit opportunities and fewer service problems after sale.

In radio, portable and pocket transistor model sales will continue to grow, providing radio stations with a vast brand-new audience of out-of-home listeners. In addition, new cordless, battery-operated, table and clock transistor radios will become very popular with housewives.

The brand-new field of stereophonic sound—already booming with stereo records and stereo hi-fi—will bring revolutionary changes in broadcasting. Radio stations and even tv stations in Canada have already experimented with stereo broadcasts by combining fm and am, tv and am frequencies for simultaneous dual-channel programming.

When a standard is established for stereo broadcasting (such as fm multiplexing) there will be a considerable market for dual-channel radios and combinations that will add further impetus to stereo sales.

How the men at the top see it

J. D. HOULDING

Vice-President and General Manager, RCA Victor Company Ltd., Montreal.

". . . major problem is over-capacity . . ."

We are anticipating generally moderate improvements in 1959 operations over those of 1958. Our optimism is based upon the apparent upturn in economic conditions and particularly in those areas affecting our industry's future.

In the field of durable goods, conditions are favorable for increased consumer expenditures. The substantial increase in housing is having a buoyant effect on sales of major appliances. Personal income and savings are at a high level and debts are being liquidated at a faster rate than new installment-buying commitments. All these factors will, we feel, contribute to a renewed growth pattern for consumer goods.

The television receiver market which has been in a steep decline since 1955 shows some signs of leveling out this year. 1959 may see some reversal of this downward trend as more and more users consider trading in their old receivers for the newer and better models. With the advent of second television stations in the major cities there should be an increased trend toward additional sets in the home.

Stereo well received

The introduction of the new stereophonic record playing instruments has been well received by the public. The record business, including the new stereo units, is now in the midst of a buying boom. In the case of radios, record players and records, technological advances have placed an array of new products in the market to compete for the consumer's dollar.

The popularity of compact transistorized radios is increasing at a rapid rate. Unfortunately, the industry faces an acute problem in rapidly increasing imports of these sets from Japan. It is impossible for the Canadian manufacturer with his relatively higher labor costs to meet this competition. In view of the potential disastrous effect on the electronic industry as a whole, with corresponding implications for Canada's electronic defence capability, it is hoped that a solution to this problem will be found which will succeed in limiting the importation of Japanese electronic products.

Defence electronic business, which is a major share of the electronics market in Canada, is going through a period of change and it is very difficult to predict the future for our industry. While the defence budget for electronics is expected to remain substantially the same, there will undoubtedly be pressure to reduce the industry's capacity to a level more closely compatible with the changing trends in defence business.

Astra cancellation

The recent cancellation of the Astra electronic fire control system for the CF-105 was a major blow to the industry as a whole and to our company as prime contractor, in particular. We are confident, however, that our Government recognizes the need for a strong electronic industry in Canada and will continue its efforts to achieve production sharing arrangements with the United States at least until such time as Canadian defence requirements and policies are more clearly defined.

We are still hopeful that Canada will undertake development of some specific aspects of Canadian or North American defence in order to maintain and challenge the creative talent available in this country amongst our engineers and scientists, as well as to provide a significant contribution to our own defence and stature as a nation. Increased expenditures in the research and development field are therefore expected and provided these are concentrated in a few specific areas, where we can complement rather than duplicate U. S. efforts, these expenditures may well result in continued growth for this industry and in continued support for the many industries which are affected by advances in electronic technology.

The major problem facing this industry is still that of over-capacity in both the consumer and in the technical product and defence product areas. There are still new companies entering this field in Canada and competitive conditions can be expected to keep profits at the present unsatisfactory level until there is a better balance between capacity and sales.

MILNE STUDIOS

A. P. H. BARCLAY, PEng

Regional Director, IRE (Philips Electronics Industries Ltd., Toronto).

". . . learning is not a step-function . . ."

In the area of non-consumer products for both commercial and government use, the Canadian electronics industry has witnessed a tremendous growth since the Second World War, particularly in the field of military electronic equipment. It is evident, however, that we are at a crossroads, where we must pass from the exuberance of youth to the maturity of manhood. As a European friend recently commented: "You people in Canada must grow longer Electronic Beards."

This calls for a selection and narrowing down of the fields in which Canada must, for one reason or another, be self-dependent, and the formulation of long-range plans and objectives. Electronic equipments are now so complex that the old haphazard approach of doing something *if and when the need arises* and through the lowest bidder can no longer succeed. Co-ordinated plans for the research, development and production phases are required.

These must have some semblance of continuity so that laboratories, both private and government, and the industry can progressively learn and grow.

Continuity vital

Learning and gaining experience is not a step-function but a relatively smooth-flowing curve. No one expects a public school student to be confronted by a university-level problem or, if so, to readily solve it. Nor would anyone think of having a university educate one generation of students, close down for a decade, then start up afresh and still be abreast of the advances in knowledge and technology which have taken place meanwhile. Yet this is the situation which daily confronts the electronics industry. Somehow we must depart from the practice of setting up facilities and training personnel for a specific project then folding everything up once that particular project is over. This is obviously inefficient and costly, and means a long delay to get the wheels of industry in motion. How could it be otherwise when we are continually starting from scratch?

Current examples of this type of situation are the present state of certain missile and aircraft electronics programs. Here again the lack of a planned approach and normal growth sequence means a long delay and the attendant expense for Canada to go through the initial stages. This swings the thinking to more and more U. S. procurement.

Danger of emigration

Fundamentally the delay and expense is only required to catch up on the technology acquired by others while we have been at a standstill. Our scientists and engineers can see that Canada is being far outpaced—small wonder they are being lost to us by emigration. In this lies our greatest danger, and to maintain independence it must be overcome.

Our "coming-of-age" can only be achieved by a closer partnership between government and industry and the growth of mutual trust and understanding in such relationships. All men are basically honest but, being human, are not infallible. Through trial and error comes greater knowledge, and we must work together with this always in mind.

Let us hope that the prospect for 1959 is at least "the growth of longer Electronic Beards."

NAKASH

Col. R. D. HARKNESS, DSO, MC, PEng

President, Northern Electric Co. Ltd., Montreal.

"... Canada's fifth protecting arm ..."

The electronics industry has continued to expand and one can confidently state that the trend over a period of years will be both upward and outward as new applications are developed and adapted to scientific, industrial and domestic needs.

Canada's transcontinental microwave system, in which a great deal of electronic equipment is used, went into service during 1958. A number of extensions to this main line, or backbone, are projected, some of which will be commenced during the coming year.

The successful commercial application of tropospheric forward scatter which was incorporated in the system now serving Seven Islands, Knob Lake and Goose Bay, Labrador, makes reliable communications possible in rugged terrain, where distances between repeater installations are greatly in excess of those permitted with line-of-sight microwave. It marked another communications and electronics milestone and was the precursor of further systems embodying the scatter principle, some of which are under active consideration at the present time.

Data processing

In the summer of 1958 an electronic data processing centre was put into operation at the Hydro Electric Power Commission of Ontario's head office in Toronto, many of the components of which were novel. These include an electronic tape message sorter, developed and manufactured by Northern Electric at its Belleville plant, the function of which is to provide and feed data into a digital computer so that various types of information received from different locations may be classified and processed.

New transistorized components such as are used in this equipment may be expected to find an increasingly conspicuous place in industry as time goes on.

Further industrial applications of electronic equipment, such as those for the recording of phenomena taking place inside nuclear reactors, and for road and rail traffic observation and control are becoming more widespread.

The state of development of the communications industry both in respect of permanent installations and test equipment is such that it is impossible to determine with accuracy which equipment is electronic and which is not.

The fifth arm

Industry in Canada, with the armed services and the Defence Research Board, is one of the primary bastions of Canada's defence and may be described as a fifth protecting arm.

Defence business plays a tremendous part in many industries today. Its role in the electronics industry in particular is more than ordinarily significant. It enables us to find employment for Canadian engineers and other vital key personnel here in Canada. It helps us to keep up-to-date in that research and development which is absolutely essential if we are properly to visualize our own defence requirements.

Continued necessity in respect of these requirements will involve an increasing use of the many electronic devices which form a part of our warning systems. Equipment of this type will be needed to an even greater extent when missile installations become an integral part of Canada's defence system.

How the men at the top see it

R. M. ROBINSON, PEng

Vice-President and
General Manager,
Electronic Equipment and
Tube Department,
Canadian General Electric
Company Ltd., Toronto.

"... an opportunity to prepare itself ..."

The electronic equipment and tube department of Canadian General Electric Co. Ltd. is a member of an industry that is expanding rapidly on a worldwide basis. Electronics business in 1958 is estimated to be 12 times as large as it was in 1945 and now ranks as the fifth largest business in the world.

A large amount of this business is devoted to defence, but the commercial part of the electronics business has also gone through very rapid expansion.

It is important therefore to distinguish between defence business, which has a major impact on the electronic industry in Canada, and commercial electronic business.

Defence

The extent of the defence electronic business in 1959 will be largely determined by the proposed production-sharing programs with the U. S.

As SAGE requirements become finalized, impetus will be given to general communications which will not only result in new facilities but also expansion of facilities within the Canadian telephone companies.

If the government should not proceed with the CF-105 Arrow aircraft program in March, 1959, it would set back in considerable measure associated manufacturing and engineering activities. This decision would affect many other activities related to the defence of North America and could greatly alter the engineering and manufacturing balance within the Canadian electronic industry.

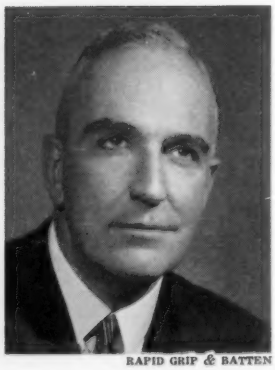
It would be of great benefit if responsible representatives of industry could participate in the discussion at the early planning stage of defence weapons. Such discussions would allow industry an opportunity to prepare itself for future programs. A more informed industry would then be able to invest its own dollars in facilities, in manpower, and in research and development to prepare for impending defence programs. The result would be a competent Canadian manufacturing base which has spent its own dollars to be ready to undertake defence programs at very short notice. This plan is presently in effect in the U. S. in their Service Science Concept.

Commercial

Computers, controls for automation of factories and industrial processes will take a major share of future electronics expenditures. Companies within the industry have continued to carry out investigations of the Canadian market potential for computers and industrial television, with a view to full-scale entry as soon as the economic circumstances are favorable. Some of the brightest prospects for the industry lie in these areas, along with general communications and industrial control systems.

The recent changes which have taken place in government control of the broadcasting industry should increase the industry volume which decreased as a result of the 1958 slowdown in the issuing of licenses.

While industry volume of mobile radio was reduced in 1958 due mainly to reduced investment in capital equipments, the new Department of Transport regulations permitting increased use of two-way mobile radio by business vehicles should continue to have a stimulating effect over the next few years.



RAPID GRIP & BATTEN

S. M. FINLAYSON

President,
Canadian Marconi
Company,
Montreal.

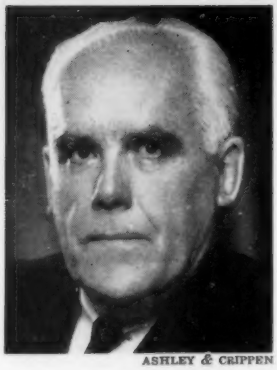
"... progress will continue in 1959 ..."

The year 1958 has seen very considerable progress in many phases of the electronics business in Canada, and according to best information available now, there would seem to be every reason to believe that 1959 will see this progress continue.

Sales of broadcast receivers continued to increase in 1958 and, while television receiver volume remained virtually unaltered, a more orderly marketing situation has improved the health and vigor of the industry.

In the case of communications and defence activities, the future is not quite so clear-cut, although undoubtedly a large potential exists. If we are not to depend on foreign sources for communications and for the scientists and engineers to design and work them, the presence of a strong electronics industry in this country is highly important to the Canadian economy.

Accordingly, the future of our industry will be largely determined by our success in showing our fellow Canadians in key positions in government and industry that we are worthy of their confidence. Once such Canadians recognize that the existence of a strong electronics industry here is largely in their hands, we are convinced that the constructive view will be taken and that the Canadian electronics industry will continue to progress in all spheres of its activity.



ASHLEY & CRIPPEN

T. W. EADIE, PEng

President,
The Bell Telephone
Company of Canada,
Montreal.

"... capital outlays will be larger ..."

Following the most pronounced slowdown in economic activity of the postwar period, the more favorable trend of recent months is expected to continue through 1959. The over-all rate of growth will still be appreciably less however, than that accomplished in the 1955-56 period since the impetus of a rapidly expanding investment program will be missing. Unemployment appears likely to remain relatively high throughout this winter.

While little change is expected in total capital spending, continued growth in consumer expenditures and some rebuilding of inventories should help to move the economy to somewhat higher levels.

Demand for telephones should be relatively strong in view of the high level of home building in 1958, which is expected to continue well into 1959. To meet this continuing demand and to provide for the necessary improvements in telephone service, our company's capital outlays will again be larger in the coming year—a pattern which has persisted for most of the postwar period. Capital expenditures exceeding $180,000,000 were made on construction in 1958.

A number of major projects are in progress which contribute in various ways to the development of the electronics industry.

Opening up the northland

For example, one of the most impressive advances of the Canadian economy in recent years has been the opening up of the north. To help meet the need for direct reliable communications, we have, in co-operation with Quebec-Telephone, put into operation a radio relay system that serves both Goose Bay and the Knob Lake area. Using regular microwave and tropospheric scatter installations it provides a trunk route from which we can extend communications into still more distant parts of Northeastern Canada.

In our own territory there are at present three cities where telephone users can dial many of their own long distance calls—Toronto, Guelph and Windsor, and plans are under way to bring Direct Distance Dialing to a number of other Ontario and Quebec centres within the next few years.

Our company has also played a major role in the engineering and construction of the Trans-Canada microwave radio relay system. A joint project of the member companies of the Trans-Canada Telephone System, this network is the longest of its kind in the world and is capable of handling both television programs and hundreds of telephone conversations simultaneously in both directions. The complete network was formally opened on Dominion Day as Canadians from coast to coast viewed a feature 90-minute television program.

G. P. ADAMSON, PEng

Manager, Electronics
Division, Canadian
Westinghouse Company
Ltd., Hamilton.

"... year of intense selling effort ..."

The Canadian electronics industry is faced in 1959 with some interesting and new developments.

The backlog of business Jan. 1 will probably be the lowest in several years, due in large measure to the termination of missile and fire-control contracts associated with the CF-105 aircraft. Relatively few large electronics contracts are on the books at this time.

Some sizable prospective business is, however, appearing on the horizon. Particularly in the defence field, some significant programs appear slated to make their impact on the electronics industry during 1959. Bomarc, SAGE, shipbuilding and ground radar programs all give promise of providing much needed business. Important developments are also occurring in commercial product areas; of particular importance will be the continued expansion of Department of Transport airport facilities, the initiation of second channel TV broadcasting and the continued expansion of Canada's northland.

Integrated production

The Canadian electronics industry will be following very closely the integrated production program for North America which is being actively promoted by the Department of Defence Production. It may be safely assumed that industry will play its full role in attempting to make this a successful program. A question of real concern hinges upon the reaction of U. S. firms and, even more important, of U. S. political influence toward letting defence business outside the country. Continuing efforts on the part of Canadian government officials as well as of Canadian industry will be required to ensure the launching of this program during 1959.

This year, therefore, promises to become for the Canadian electronics industry, a year of intense selling effort and, to only a slightly lesser degree, of significant engineering effort, occasioned by the introduction of several large programs. Manufacturing loading, however, will be light during the first part of the year, but shows some promise of improving toward the last quarter. It appears, therefore, that reasonable billings and profits will be difficult to achieve in spite of a promise for good bookings.

How the men at the top see it

B. G. BALLARD, OBE, DSc, PEng

Vice-President (Scientific) and Director, Radio and Electrical Engineering Div., National Research Council, Ottawa.

"... more speculative development ..."

There are two important areas in which the Canadian electronics industry can help to ensure its own future prosperity.

Firstly, electronics manufacturing concerns could profitably indulge in more speculative development programs. We have before us examples of Canadian developments now being exploited by foreign companies. Why should the process not be reversed more often, following the lead set by a few Canadian electronics firms that have successfully entered both the domestic and foreign markets with products designed and developed in this country?

Secondly, Canadian industry should be able to look toward electronics to give some release from our slavery to the problems of mass production. There are many areas in which Canada cannot presently compete with U. S. industry, but could with the proper application of electronic controls, computers, etc. For example, the development of appropriate punched-card systems for the control of machine tools could save the heavy investment involved in providing the expensive dies needed for long production runs.

However, this problem must be approached with sanity —we must not solve the problems of manufacturing products of which a new model is normally brought out every year, only to immediately try to bring out a new model every six months.

E. W. LEAVER, PEng

President,
Electronic Associates Ltd.,
Willowdale, Ont.

"... a time of painful re-appraisal ..."

The Canadian electronics industry is in the midst of a serious crisis.

The growth which has characterized it over the past 10 or 15 years has been halted.

The politics, geography and economics of the country are now taking their toll, and like all secondary industries, and in fact Canada itself, it faces a time of painful reappraisal.

Failure to recognize these facts sooner, is partially to blame for the state in which the industry and the country find themselves today, and a continuing failure to be honest about it will not help. Most unpleasant situations do not clear themselves up if they are merely ignored.

Problem affects whole country

This is not just an industry problem, it is a problem weighing on every aspect of Canadian life.

The blunt fact is that the present "mood framework" in which industry and the government must operate is not economically viable.

Canada has long prided herself in finding compromises. At the moment we are well advanced in the process of compromising ourselves out of business, politically and economically.

Perhaps we have waited too long to become a nation, but if not, then we must actively pursue those policies that can make such an entity viable.

Secondary industry is vital to the life of a nation today, and electronics—the common denominator of industry, the home and the military—is an essential ingredient.

Future progress in these fields is directly dependent on electronic development. We cannot live indefinitely parasitically off other nations in this field, if we wish to grow as an independent country.

To make secondary industry, and the electronics industry grow, we must make some fundamental changes in our approach, both as an industry and as a country.

Buy Canadian

The industry must continue its efforts to buy everything it can in Canada. It must increase its technical development programs. It must intensify its sales efforts here and in the rest of the world, increase the "service" aspects of its sales, and actively pursue applications for its goods.

Industry must engage in long-range as well as short-range planning, and co-operate with other organizations and the government to our common good.

Government must create the climate in which secondary industry can flourish.

This implies a fair balance in the way the government treats the various sections of our economy, and fairness between government and industry.

Today, for example, secondary industry taxes are used to subsidize the production of surplus agricultural products. When these are "sold" abroad, they must be paid for in goods, directly competitive with our own, but produced with labor at a fraction of our wages.

The government can also be fairer to industry by buying goods at home. In its own interest, it should not consider the profit that builds plants and secures jobs, a bad word *per se*. It can make the applications of its rules and regulations reciprocal and do its best to reduce them to manageable proportions.

We tax ourselves to educate our people to high levels of technical competence. Then we contribute those people

and their skills, both of which we need so badly ourselves, to other countries free of charge, because we do not provide them with opportunities at home.

Long-range planning

Government could establish long-range plans and acquaint industry with those plans. Then industry could be built on a sound economic basis, highly desirable in the unstable Canadian economy.

But all of these things depend on a fundamental decision that we, as Canadians, can only make for ourselves. We must make up our minds as to what kind of a country we want, and determine the ways in which we can build it. Then we must marshal up the ambition to work for it and the guts to fight for it.

If we do these things, the future of Canada and the electronics industry in particular, will be very bright indeed. But if we do not, we will have frittered away a great deal more than we have imagined.

Electronics industry 5 year stock prices

	1958*		1957		1956		1955		1954	
	High $	Low $	High $	Low $	High $	Low $	High $	Low $	High $	Low $
Admiral Corp.	B17	A17⅛	..	..	18	17½	26½	26½	20	20
Analogue	5.50	2.10	3.50	1.95	..	..	..	..	..	..
Anglo Cdn. Tel.	44	33	46	36	50¼	40	53	47	48	39
Beatty Bros.	7.00	3.50	7½	3½	8	6	8¾	6¾	7¾	6⅜
Bell Tel.	42⅞	39¾	46½	35⅝	51¾	43¾	52¼	45⅛	47	39¾
B.C. Tel.	44⅜	38½	47¼	37	52¼	43	50½	43½	45	35
Cdn. General Elec.	695	695	765	700	1000	755	1100	675	675	545
Cdn. Marconi	.87½	1.90	4.10	1.90	6.62½	3.00	8⅜	6	7¾	4¼
Cdn. Westinghouse	57	44	50	35½	52	35⅛	70	47½	78½	62
De Havilland A	B150	A250	190	190	150	150	200	141	169	98
Dom. Electrohome	26½	11	13	7	15	7	7¾	3¼	5¼	3½
Fleet Mfg.	.81	.31	1.10	.30	2.00	.85	2.85	1.40	2.55	1.55
Gen. Dynamics	65	53¾	66½	47	77½	45¾	125⅛	48	80	35
Inglis, John	5.12½	2.70	6.50	2.40	17	4¼	14	10¾	12½	7
Isotope Prod.	..	..	▲1.85	▲1.10	2.60	1.15	..	..	..	..
Northern Tel.	4.25	2.70	4.50	2.50	..	..	..	..	..	..
Quebec Tel.	32	18¾	25⅜	16½	21¾	18½	25	14¾	..	..
Roe, A. V. (Can.)	15⅞	12	25½	10¼	18⅛	16	..	..	..	..
Stand. Radio	15	12¼	12¼	12	12¼	11	12	9	11⅞	7

*Compiled at week ending December 12, 1958. B & A: bid and asked, at week ending December 12, 1958. ▲Delisted

Progress in 1958 — continued

government decision to cancel the Astra and Sparrow programs. In a brief submitted to Prime Minister Diefenbaker last fall, it was pointed out that employment in our industry at that time was down approximately 20% from 1957. Cancellation of a major project such as the Arrow Weapon System could have serious consequences on the future of our industry. Skilled personnel would have to seek employment elsewhere and become lost forever from the industry and from Canada.

Subsequently, the Government Liaison Committee of EIA met with the Minister of Defence Production to discuss all the factors involved. One bright aspect of this crisis could be much closer liaison between the industry and the government.

Institute of Radio Engineers

The third annual IRE Canadian Convention and Exposition can be called a definite success. Coming, as it did, at a time when the electronics industry was going through a rough period, the convention attracted more technical people than ever before. The displays were much better than in previous years, and the technical papers maintained the high professional standards established in the first two years. The many engineering achievements displayed at this annual convention, both in the exhibits and at the sessions, are the best indication of the ability of Canadian designers. We have the quality. All we lack are the quantity, the publicity, and the faith of civic leaders.

New companies and facilities

During 1958 several new companies were formed in Canada, while others reorganized or opened new plants and offices. These are the major changes.

Canadian Motorola Electronics Ltd. was formed in Toronto to manufacture and service communications equipment. Ivor H. Nixon, formerly with Pye Canada Ltd., formed a manufacturers agency under the name of Tele-Radio Systems Ltd. Lake Engineering Co. Ltd. signed an agreement with the newly formed Elcom Marketing Ltd., whereby Lake provide application engineering facilities to go with the marketing experience of the Elcom personnel. Canadian Electronics Co. changed its name to Gomard Electronics Ltd.

The Philips group in Canada, formerly known as Canadian Radio Manufacturing Co. reorganized its operations into one company, Philips Electronics Industries Ltd. At Canadian Marconi Co. the commercial products and marine divisions were merged into the engineering products division. Zenith Radio Corp. of Canada Ltd. formed a radio-TV-electronics division.

Ferranti Electric Ltd., Toronto, and Packard Electric Co. Ltd., St. Catharines, Ont., merged under the name of Ferranti-Packard Electric Ltd. At Arnprior, Ont., Measurement Engineering Ltd. became a public company.

Canada Wire & Cable Co. Ltd. opened its sixth plant in June of last year. Covering an area of 113,000 sq. ft., the new plant at Simcoe, Ont., houses complete facilities for the magnet wire division. Underwater detection equipment for the Royal Canadian Navy went into production at the new Edo (Canada) Ltd. plant in Cornwall, Ontario.

PHOTOS BY MARKOW

This is the master control centre for the radio and TV system in the Queen Elizabeth Hotel, Montreal.

Queen Elizabeth hotel radio and tv system sets a high standard

PETER C. WHITEHOUSE, B.A. CORRESPONDENT

Designing the radio and tv system for the Queen Elizabeth hotel in Montreal was a major undertaking. Distortion and interference has been kept to a minimum by using good equipment and separating all tv channels. The manager can page all rooms in emergency

Montreal's Queen Elizabeth is Canada's newest major hotel. It has yet another claim to distinction in that it boasts the most elaborate and complete radio and TV network, not only of any hotel in Canada, but in the world. This network provides the 1,200 rooms of the hotel with radio programs on six wavelengths and TV programs on seven channels (including a closed circuit), all with a minimum of distortion.

One of the major problems of the installation arose from the long cable runs for the TV signals. To ensure that there would be no interference between signals a dead channel has been left between every two active channels. This resulted in the use of a number of frequency converters.

On the roof there are eight separate TV antennas, one each for channels 2, 3, 5, 6, 7, 8, 10 and 12. The 300 ohm lines from the antennas connect to 72 ohm matching transformers so that the signals can be fed by coaxial cables to the amplifiers on the twenty first floor of the hotel.

At the present time there are no stations within the Montreal area transmitting on channels 10 and 12. However, it is anticipated that programs will be available on those channels in the near future, so antennas, amplifiers and cables for them have been included in the Queen Elizabeth installation.

To overcome cable losses and improve channel separation the signals from the antennas are amplified in equipment located on the twenty first floor. Each channel has its own amplifier and the amplifiers for the weaker signals are fitted with traps to eliminate interference from the more powerful adjacent channels.

The signals then are fed by cable to the central control room on the third floor where they receive further amplification. Here again, channel trapping is provided where necessary.

During initial planning it had been suggested that cross switching of all channels be provided so that the system

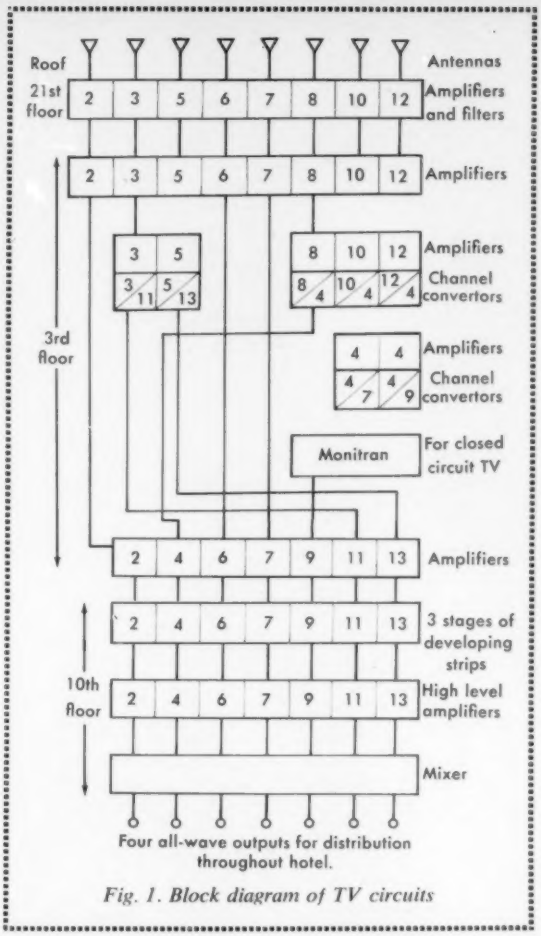


Fig. 1. Block diagram of TV circuits

would be completely flexible. This was modified in the actual installation since a reasonable degree of flexibility could be obtained at much less cost by providing switching for a limited number of the channels.

Fig. 1 shows the arrangement for the interconnection between channels and the arrangement of the equipment at the various floors of the hotel. At the present time channels 2, 6 and 7 feed through without conversion. Channel 3 is converted over to 11, 5 over to 13, and 8 over to 4. In fig. 1 the convertor stages show the input channel on the left and the output channel number on the right side of each diagonal. It is possible to switch through more than one stage of conversion. For example channel 8 could be switched over to channel 7 by going through 8/4 and 4/7. Each square in fig. 1 denotes one or more stages of amplification.

Amplified and converted output from the control room on the third floor is fed to the 10th floor for final amplification, agc, combination and distribution. The agc is introduced to control signal level on all channels at about 2 volts.

From the final hi-level amplifier the signals pass through a splitter transformer to create four main distribution circuits for different sections of the building. Each circuit has all seven channels.

Distribution to the 1,200 rooms is by coaxial cable. Each of the four final output circuits goes either to a two-output or four-output splitter transformer. In turn these are split as needed to provide feed-ins for the individual receivers in the rooms.

All call alarm circuit

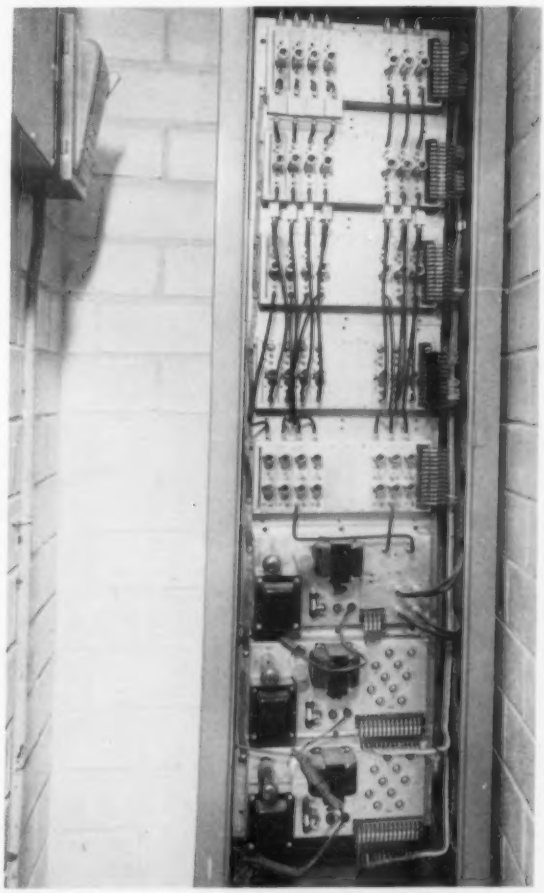
The signal distribution system also features an all-call alarm circuit for emergency calls to all guest rooms in event of fire or similar danger. This is controlled from the manager's office and when the switch is operated it energizes relays in the third floor control room which isolate the complete circuit from all incoming signals, and link it up exclusively with transmissions over the all-call. Whether the guest has his set on or off, the signal will still come through.

The Monitran makes closed circuit transmission possible within the hotel on channel nine by impressing audio and video signals as modulation on a carrier. With some modifications and additions, monitran could be used to pipe in TV by wire for transmission throughout the building.

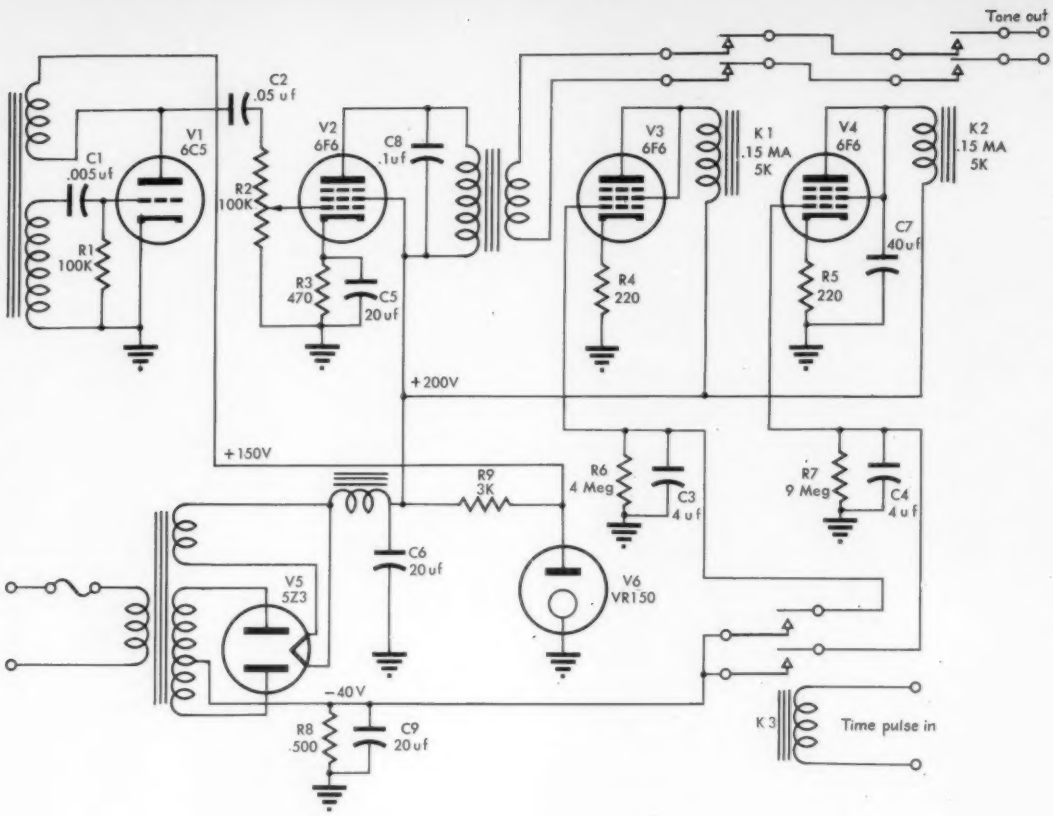
Radio programs are fed from the antenna on the roof directly to the third floor. Six am/fm tuners and amplifiers provide as many radio circuits for the guests. Distribution to the rooms is by six pairs of cables running beside the TV distribution cables. The all-call circuit is a single line with ground return.

The entire system has been designed and installed by the Service Department of RCA Victor Co. Ltd., Montreal. Mr. N. Fields was the man in charge of the project.

It is a system that will undoubtedly set the pattern for installations in most large hotels of the future. It may even be used in some of the modern apartment blocks. END



TV signals receive final amplification and agc at tenth floor before being divided for distribution in the hotel.

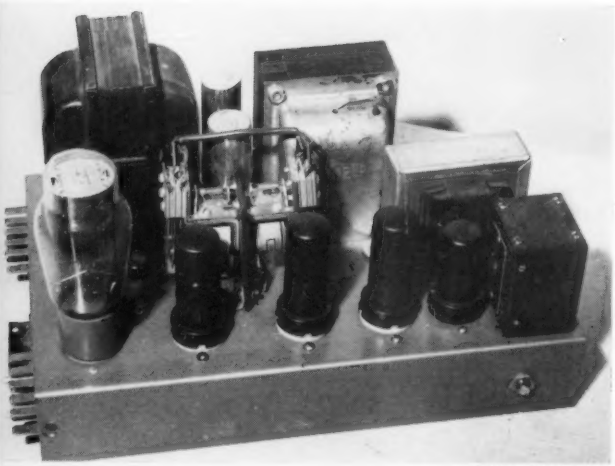


McGill Observatory signals trigger

CKAC electronic time signal generator

L. SPENCER & R. DOIRON*

Radio station CKAC receives time signals from the McGill Observatory in Montreal. These signals are used to trigger an electronic time signal generator consisting of an oscillator, amplifier buffer, and gating circuit. This provides a one-second station tone every hour



PHOTOS BY MARKOW

The CKAC electronic time signal generator provides one-second tone signals on-the-hour during station breaks.

Accurate tone signals transmitted by wire from the McGill Observatory are available in the City of Montreal. The pulse sequence is such that there is a blank of 72 seconds at the 60-minute period, and a blank of 12 seconds every five minutes. The pulses are fractional second every two seconds.

Our problem at Station CKAC was to design an electronic circuit operated by this sequence which would give us a one-second tone on the hour for transmission and a fractional-second tone every five minutes to keep our

*Radio Station CKAC, Montreal.

electric clocks synchronized. This is a description of the circuit used to provide the one-second tone each hour.

The McGill signal is a fractional-second pulse every two seconds except as noted above where 36 pulses are omitted prior to the hour and six pulses prior to every five minutes.

During pulse signal periods, relay K_3 closes two contacts every two seconds, charging C_3 and C_4 to —40 volts. R_6C_3 and R_7C_4 are of long enough time constant to prevent V_3 and V_4 from conducting during the 2-second intervals. With both tubes nonconducting, relay K_1 contacts are closed and relay K_2 contacts open. The tone is prevented from reaching the output by K_2 only.

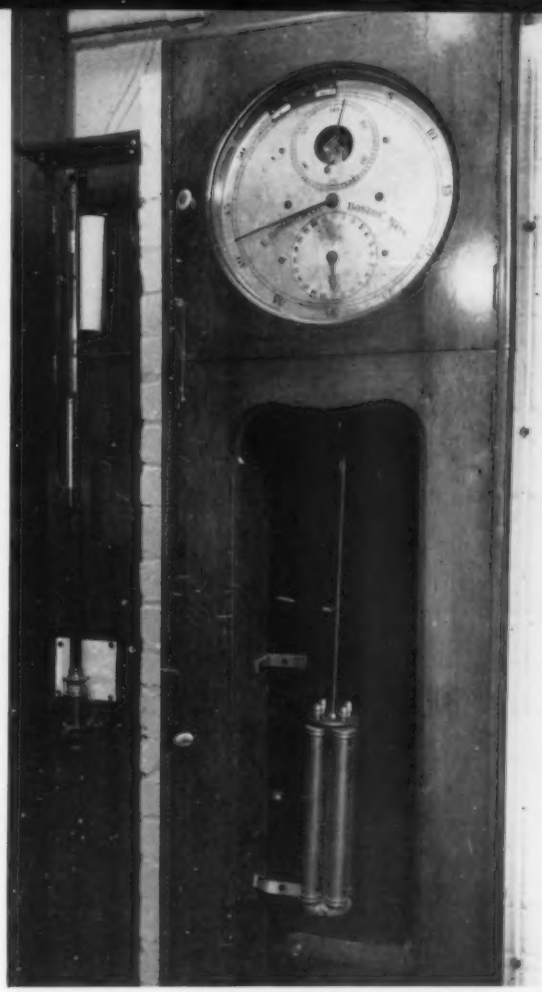
On time pulse interruption preceding the hour, R_6C_3 time constant is such that R_6 discharges C_3 to near zero potential in approximately 15 seconds, causing V_3 to conduct, actuating K_1 which opens the tone relay contacts. Due to the longer time constant of R_7C_4, V_4 actuates K_2 approximately 20 seconds later, closing its contacts. Thus after 35 seconds of time pulse interruption, both tubes are conducting with tone now prevented from reaching the output by K_1 only. The circuit is now ready to emit a 1-second tone.

Prior to each hour there is a 72-second blank period. Then, on the hour, the first pulse energizes K_3 causing both C_3 and C_4 to charge to —40 volts, biasing V_3 and V_4 to cut-off. Relay K_1 drops out immediately, closing its contacts. The tone passes through to the output because K_2 does not drop out until C_7, which charges through the coil of K_2, has been charged. This permits the tone signal to pass for a period of one second.

Tubes V_3 and V_4 then remain in the cut-off condition until the next pulse interruption.

The tone amplitude is determined by the setting of R_2, while the duration of the tone output is controlled by the value of C_7 and the resistance of the coil of K_2.

The frequency of the tone generator is determined by R_5C_1. The values have been selected to give a tone very close to 1000 cps. The plate voltage of the oscillator required regulation due to the voltage variation caused by sudden conduction of V_3 and V_4 at the beginning of the tone signal. The frequency of oscillation is quite sensitive to variations in plate voltage. END



Timing pulses from this master chronometer at the McGill Observatory are available throughout the Montreal area.

Transient response of band suppression filters

Correspondence received from H. L. Armstrong, Dept. of Physics, Queen's University, Kingston, Ont.

Recently Price[1] has discussed the way in which a twin-T filter responds to a transient input. It may be of interest to consider next the effect on a transient of any band suppression filter with a relatively narrow stop band.

Let the filter have a stop band between (angular) frequencies $\omega_0 - \delta$ and $\omega_0 + \delta$. This makes its transfer function $G(j\omega)$ come to be

$$G(j\omega) = \begin{cases} 0 \; (|\omega - \omega_0| \leqq \delta) \\ 1 \; (|\omega - \omega_0| > \delta) \end{cases} \quad \ldots\ldots\ldots (1)$$

Here the Laplace transform variable s, has been replaced by $j\omega$, and, of course, $j^2 = -1$.

Let the applied transient have a transform $e_i(j\omega)$; then the actual response $e_0(t)$ can be found from the integral

$$e_0(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} e_i(j\omega)\, G(j\omega)\, (\cos \omega t + j \sin \omega t)\, d\omega. \quad . (2)$$

This is derived by integrating the usual complex expression along the imaginary axis where s becomes

$j\omega$ automatically[2]. Now if $G(j\omega)$ were identically unity, this expression would just reduce to $e_i(t)$, the applied waveform, since there would be no change. But one could write

$$G(j\omega) = \begin{cases} 1 - 1, & |\ \omega - \omega_0| \leqq \delta \\ 1 - 0, & |\ \omega - \omega_0| > \delta \end{cases} \quad \ldots\ldots (3)$$

and use the sums to break the integral into two parts. One part would just give $e_i(t)$ and finally one would have

$$e_0(t) = e_i(t) - \frac{1}{2\pi}\int_{-\omega_0-\delta}^{-\omega_0+\delta} e_i(j\omega)\,(\cos\omega t + j\sin\omega t)\,d\omega$$

$$- \frac{1}{2\pi}\int_{\omega_0-\delta}^{\omega_0+\delta} e_i(j\omega)\,(\cos\omega t + j\sin\omega t)\,d\omega. \quad (4)$$

Often e_i will be either an odd or even function. In either case one can change equation (4) to

$$e_0(t) = e_i(t) - \frac{1}{\pi}\int_{\omega_0-\delta}^{\omega_0+\delta} e_i(j\omega)\begin{Bmatrix}\cos\omega t \\ j\sin\omega t\end{Bmatrix} d\omega, \quad \ldots\ldots (5)$$

the cosine being used if e_i is even, the sine if it is odd.

Now some examples will be considered.

The unit step

For the unit step, $e_i(j\omega) = 1/j\omega$ and so

$$e_0(t) = 1 - \frac{1}{\pi}\int_{\omega_0-\delta}^{\omega_0+\delta} \frac{\sin\omega t}{\omega}\,d\omega. \quad \ldots\ldots (6)$$

Usually $\delta << \omega_0$; accordingly, as a good approximation replace ω by ω_0 in the denominator of the integrand. The integration then goes easily and one gets

$$e_0(t) = 1 - \frac{2}{\omega_0 t}\sin\omega_0 t\sin\delta t \quad \ldots\ldots (7)$$

Thus $e_0 t$ starts out at value unity, falls to a minimum in about time $\pi/2\delta$, and recovers in an oscillatory way. The recovery will be fairly complete at time $2\pi/\omega_0$. This representation of the behaviour is to be compared with Price's exact treatment of a special case of filter—the twin-T.

Unit sinusoid whose frequency is outside the stop band

This case will be considered first since it follows more directly from the previous one. Let the applied voltage have an angular frequency ω_1 and $|\ \omega_1 - \omega_0| > \delta$. Then, by the same procedure as before, one finds

$$e_0(t) = \sin\omega_1 t - \frac{\omega_1}{\pi}\int_{\omega_0-\delta}^{\omega_0+\delta} \frac{\cos\omega t}{{\omega_1}^2 - \omega^2}\,d\omega. \quad (8)$$

Since $\omega \simeq \omega_0$ over the range of integration, substitute ω_0 for ω in the denominator of the integrand, to get finally, in this approximation

$$e_0(t) = \sin\omega_1 t - \frac{2\omega_1}{\pi({\omega_1}^2 - {\omega_0}^2)t}\cos\omega_0 t\sin\delta t. \quad (9)$$

This shows how the output is affected initially by the presence of the filter, but after a time around, say, $3\pi/2\omega_0$ it has nearly settled down to its steady state value.

Unit sinusoid whose frequency is inside the stop band

In the above example the approach was to work out a correction to the steady state value; since this was only a correction, various approximations could be used. In the present case, the steady-state output is zero. Thus the whole solution, one might say, is a correction term and can be determined directly. This gives the formula (from equations (1) and (2)).

$$e_0(t) = \frac{\omega_1}{\pi}\int_0^{\omega_0-\delta} \frac{\cos\omega t}{{\omega_1}^2 - \omega^2}\,d\omega + \frac{\omega_1}{\pi}\int_{\omega_0+\delta}^{\infty} \frac{\cos\omega t}{{\omega_1}^2 - \omega^2}\,d\omega$$

$\ldots\ldots (10)$

The notation is the same as above; here, however, $|\ \omega_1 - \omega_0| < \delta$. Over the range of the first integral, ${\omega_1}^2 > \omega^2$; accordingly, as an approximation, the denominator is replaced by ${\omega_1}^2$. Likewise, in the second integral ${\omega_1}^2 < \omega^2$, so the denominator is replaced by $-\omega^2$. Thus one gets

$$e_0(t) = \frac{\sin\omega_0 t}{\pi\omega_1 t} - \frac{\omega_1}{\pi}\int_{\omega_0+\delta}^{\infty} \frac{\cos\omega t}{\omega^2}\,d\omega. \quad \ldots\ldots (11)$$

In integrating the first integral, the approximation $\omega_0 + \delta \simeq \omega_0$ was made. For the second integral, the first term in an asymptotic development (which is essentially the asymptotic form of the cosine integral[3]), found by integration by parts, will do. Thus one finds

$$e_0(t) = \left(\frac{1}{\omega_1} + \frac{\omega_1}{{\omega_0}^2}\right)\frac{\sin\omega_0 t}{\pi t} \quad \ldots\ldots (12)$$

Here the output starts to follow the input fairly closely, but by about time $2\pi/\omega_0$ it has fairly well recovered to zero, its steady state. It will be noticed that the special case in which the applied frequency is the centre frequency of the stop band, i.e. $\omega_1 = \omega_0$, is included in the above formula.

Conclusions

Several approximate formulae have been given for the response of a band suppression filter to various transients. The results are seen qualitatively to resemble those give by exact calculations for a particular case of filter, the twin-T circuit. It is believed that the techniques used here could be extended to discuss qualitatively or semi-quantitatively the action of other types of filter, and this might be expecially useful in cases in which an exact analysis becomes very difficult. END

References:

1. M. Price, "How Quickly Does a Twin-T Respond," Canadian Electronics Engineering, Vol. 2, No. 9, p. 40, September 1958.
2. J. C. Jaeger, "An Introduction to the Laplace Transformation," Methuen and Co. Ltd., London, 1949, sections 25 and 26.
3. E. Jahnke and F. Emde, "Tables of Functions," Teubner, 1933; reprinted by Dover, 1945, p. 3.

For your library

Two books contribute to the subject of random noise

Principles and Applications of Random Noise Theory

Julius S. Bendat; John Wiley & Sons, Inc., New York; 431 pp; $11.00.

Principles of Noise

J. J. Freeman; John Wiley & Sons, Inc., New York; $9.25

These two books have been reviewed by E. L. R. Webb, Senior Research Officer, Radio and Electrical Engineering Division, National Research Council, Ottawa.

In the past decade or so, textbooks have not kept pace with the rapid advances in the theoretical and practical methods of handling random noise problems. This may have been due in part to the difficulty of the subject despite the availability of much of the necessary basic information in the books of other subjects — mathematics — statistics — electric circuit theory, etc. — and also in part to the rapid growth of the subject and of its literature in the technical journals. This has not greatly hampered the established professional, but has made things difficult for students and their teachers.

Several books have been published in recent months that should in large measure close the gap, and the two under review are representative but not necessarily competitive. Dr. Freeman's announced aim is to provide enough background material in noise analysis to permit one to use the journal literature as a professional tool. This has undoubtedly been achieved in the particular environment that gave rise to the book. However, it is probable that in other environments where the preparatory background of students has different strengths and weaknesses, this book will contain some redundant material and also leave awkward gaps. To be specific, much of the material on Fourier analysis and circuit theory contained in the first chapter ought to be well known to electrical engineers. On the other hand the treatment of probability and random processes, the proper subject of this book, in subsequent chapters appears to suffer from too much naked mathematics and too little English text. In this respect the book is non-elementary and would by itself be a difficult introduction to its subject. Nevertheless the essential subjects — physical sources of noise—equivalent noise generators — noise factors — are exhaustively covered from an engineering point of view, albeit in a slightly old-fashioned way, since the examples and applications deal mainly with thermionic tubes to the exclusion of modern semi-conductor devices. One of its chief virtues is that it assembles in one place a lot of useful material previously scattered throughout the literature.

The development of fundamentals is followed by a very interesting chapter on dc measurements in the presence of noise, and, after a mathematical disgression on Gaussian processes, a treatment of ac measurements that leaves untouched many of the communication and control aspects of noise A-C waveforms. The present volume does not treat advanced correlation and optimization subjects, but the tools of noise analysis are applied to relatively simple problems.

By contrast, Dr. Bendat's book strikes a better balance in several respects, of which the most noteworthy is the better introductory and connective text, which should both attract and benefit the individual reader. Also, the organization of subject matter, so as to begin logically with a general discussion of random processes, is less likely to scare off potential readers. Historical and numerical material readily available elsewhere is kept to a minimum leaving more room for current and advanced topics. It is interesting to note in passing that more than half of the 141 references in the bibliography are less than five years old. (Dr. Freeman does not give a bibliography but a few references scattered throughout his book tend to be to classical works 10 or more years old.)

The introductory phase of Dr. Bendat's volume includes probability theory, power spectral analysis, and linear prediction and filtering. A later chapter is devoted to time variable filters but this is deferred until the subject of correlation has been thoroughly developed. This development begins with a review of processes that give rise naturally to autocorrelation functions of exponential-cosine form. The importance and generality of this functional form appears to have been underestimated in the past and even in the present treatment the author fails to use explicitly the most easily understood explanation of the basic process — namely the "ringing" properties of damped resonant structures excited by random impulses.

One of the major benefits conferred by the recognition of the exponential-cosine function is the possibility of using analog computers for the economical solution of certain noise problems—and this is the subject of the ensuing chapter. The next two chapters defy brief characterization beyond the inadequate description that they deal, mainly from a correlation point of view, with the topics of wide-band noise and (the envelope of) narrow-band noise respectively. These subjects are of fundamental importance in practical applications and while they are usually quite straightforward physically, become very involved analytically.

The final chapter contains a renewed attack on that incompletely solved "zero-crossing" problem which despite, or perhaps on account of, its conceptual simplicity continues to be unsatisfactory in several respects. It hardly needs to be said that such topics take this book out of the elementary class; however, the author's lucid style throughout allows one to at least follow the arguments to their present state of development.

As mentioned earlier, these two books on the same subject are not in direct competition and prospective purchasers are advised to examine both and compare them with other recent publications, and consider which may best serve their needs.

The Printing of Mathematics

T. W. Chaundy, P. R. Barrett and Charles Batey. Oxford University Press, Toronto; 105 pp; $3.00.

This book is designed not only to help the printer, but also to assist authors to understand the technical problems which are peculiar to the composition of mathematics. Detailed methods are recommended to authors by which they may ease the printer's task and their own.

The writers of this work are all concerned with the reading or printing of mathematics at Oxford University. The three main sections comprise a description of the mechanics of mathematical printing, recommendations to mathematical authors, and a set of rules for the composition for mathematics. The latter were originally drafted at the Press over 20 years ago, and have been amended as a result of continuous trial and experience.

Appendices on legible handwriting, type specimens and list of special sorts, and abbreviations round out a very useful reference text for engineers and scientists whose mathematical work is to appear in printed form.

History of Mathematics

D. E. Smith; (Dover Publications, Inc.) McClelland & Stewart, Toronto; Vol. 1, 596 pp; Vol. 2, 725 pp; $5.50 total.

Seldom have I felt so humble as the day I started to read Professor Smith's History of Mathematics. It was not news to me that so much of the mathematics I use day by day date back to 500, 1000, or 2000 BC. But somehow, as a student, I had been so busy learning the language of mathematics that I failed to see the great human drama behind it.

These two volumes make fascinating reading. Volume 1 treats the subject chronologically, starting with primitive concepts of counting (about 50,000 BC) and proceeding through the major contributions of Egypt, Babylonia, early and late Greece, the Orient, Roman and medieval worlds, Renaissance Europe, right up to the end of the 19th century. This is a factual book, written in a conservative but interesting style. The works of over 1,100 mathematicians are considered and extensive references are supplied on each for further reading.

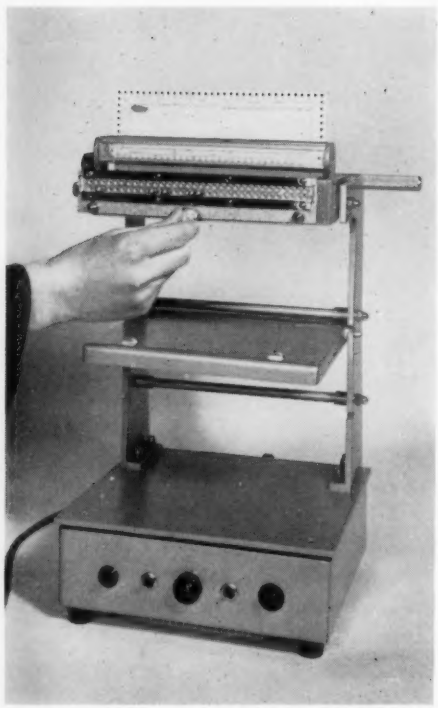
Volume 2 considers the development of mathematics in terms of specific fields

(Continued on page 48)

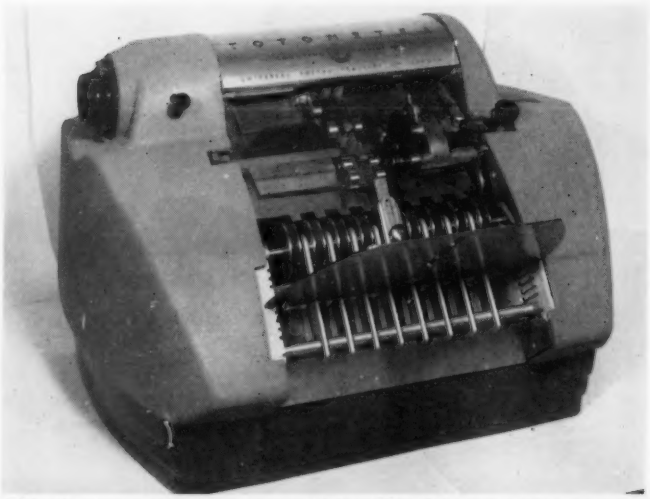
What's new in view

From offices to power stations electronics keeps finding new applications

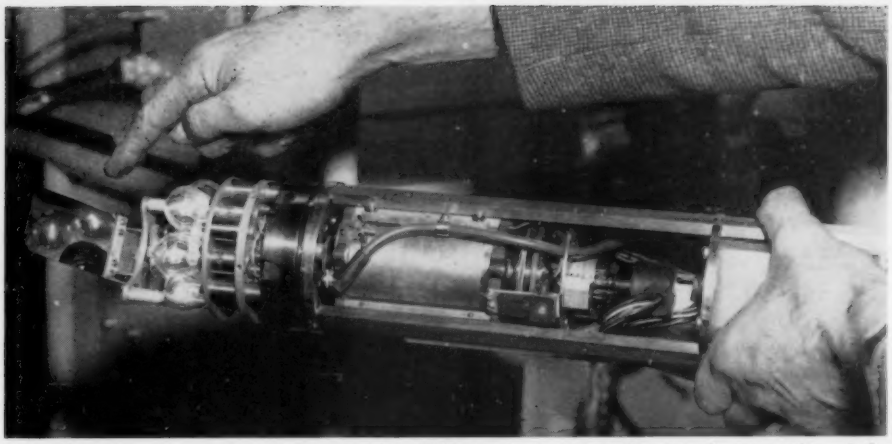
A crossing tender for the Delaware & Hudson Railroad, Cohoes, N.Y., adjusts a General Electric closed-circuit television monitor as he prepares for the day's traffic schedule. The monitor gives him a clear view of switching engines approaching the main line from an industrial spur track (middle of monitor screen) a half mile away.



A new punched card system introduced by George Anson and Company Ltd., London, Eng. Cards required are selected by a rod and an electrical vibrator automatically ejects them.

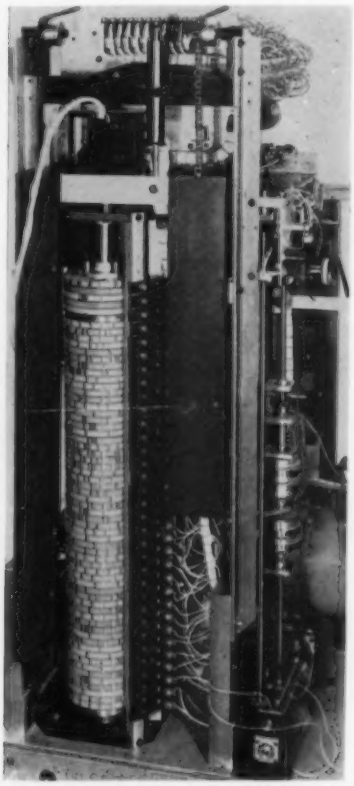


This Totometer machine counts bills with 100 per cent accuracy at speeds up to 900 a minute. It will also handle money orders, tickets and coupons and at the same time as counting them it can also overprint or mutilate them. Made by Universal Postal Frankers Ltd.



Pye television camera for U. K.'s Calder Hall atomic power station permits inspection of the reactors while they are still radio-active. Designed for operation in temperatures of 150-200 deg C, cooling is by carbon dioxide pumped through the rubber housing of the control cables.

The main Montreal branch of the Bank of Nova Scotia is putting into operation for the first time in Quebec brand new electronic book-keeping machines made by Burroughs Corp. Costumed man in background demonstrates bank's original accounting methods, equipment and lighting of over one hundred years ago.



Memory unit of the Samastronic summariser and recorder by Powers-Samas. Any one of 50 stored characters can be printed in any of 140 positions.

Representative for mobile radio

Gordon Ruth & Co., has been made an authorized representative for the Canadian General Electric Progress Line two-way radio. Mr. Ruth will utilize existing sales and service facilities at 354 Princess St., London, Ont., and will service the Sarnia, Goderich, Wallaceburg, Stratford, Woodstock, Simcoe, London and St. Thomas areas.

Canadian company changes name

The company formerly known as Canadian Electronics Co., has recently become incorporated under the name of Gomard Electronics Ltd. The personnel, operation and address of the organization remain unchanged. Their facilities are at 180 Chatham St., Hamilton, Ont., telephone Jackson 8-1266.

Scientific company names Canadian representative

The San Jose Scientific Company, California, has appointed E. E. Whittaker, Arnprior, Ont. as its Canadian representative. The company manufactures a series of potentiometer-type recorders.

New products for distribution

Electro Sonic Supply Co. Ltd., Toronto, has been appointed a distributor for Sunbeam Electric Power Tools.

They have also announced their appointment as a distributor of Cambridge thermionic Corp. electronic components. Products from both of these companies will be stocked by Electro Sonic Supply Co. Ltd.

Copper and brass association

A new organization, known as the Canadian Copper and Brass Development Association, has been formed with offices in Toronto. It is a non-trading organization supported by copper producers and manufacturers, and its purpose is to promote and develop the use of copper, its alloys and compounds in all the various phases of modern living.

President of the new Association is J. S. Vanderploeg, president of Anaconda American Brass Ltd. Association offices are at Room 1101 — 55 Yonge St., Toronto.

Serenade in stereo

Pedestrians and motorists passing by the Port Credit plant of Canadian Admiral Corp. Ltd., were serenaded in stereo during the Christmas season. Two three-hour stereo programs of carols and other seasonal music were played six days a week from speaker units mounted on the factory roof.

The speaker units were mounted about 100 ft. apart to give the listeners full benefit of the music played from stereophonic records.

EIA members support "Made in Canada"

Over one quarter of a million red, white and blue labels have been distributed by EIA to its members in the Receiver Division. These gummed labels are being attached to radio and TV receivers, and audio equipment before being shipped from the factories.

The labels read "Made in Canada. Canadian quality — it's better."

New member for EIA

Ferranti-Packard Electric Ltd., Industry St., Mount Dennis, Toronto 15, Ont., has joined the Electronics Division of EIA. Products manufactured by the company include computers, peripheral equipment and communications equipment.

Long-range radar at Winnipeg

The Department of Transport is progressing with its installation of air traffic control radar at Canadian airports. The equipment at Stevenson Field, Winnipeg, has been installed and tested. It has a range of 150 miles with a ceiling of 60,000 ft.

Montreal students seek their own radio

The students executive council at Sir George Williams College has approved plans to establish a college radio station. Final approval must come from the faculty before the students can install the fm equipment. Preliminary approval has been obtained from the Department of Transport to operate the station as an educational and experimental facility. Programs would be aimed primarily at adults.

Canadians like to talk

Figures just released by The Bell Telephone Company of Canada show that Canadians are among the most talkative people in the world. In 1957 an average of 497 telephone calls were placed for every person in Canada. This was the world record, followed by Sweden with 491 calls per person.

and problems. While there is some duplication of subject matter between the two volumes, it would be a mistake to think that the full story can be obtained from one volume alone, or that reading one would detract from the interest of the other. In fact, the opposite condition exists.

These two volumes should be on the supplementary reading list of all engineering students and graduates.

Catalogues and brochures from the manufacturers

Battery and power connectors. Twenty-page catalogue GB-7-2958 provides full description and specifications. Cannon Electric Canada Ltd., Toronto. (101)

Electronics 1958. New products supplementary buying guide. 52-page catalogue of radios, audio equipment, appliances and components. Canadian Electrical Supply Co. Ltd., Montreal. (102)

500- and 1,000-watt am transmitters are described in 8-page brochure AM-33158. RCA Victor Co. Ltd., Montreal. (103)

Present status of communications measuring art. This is a 29-page report with a supplement listing Siemens instruments. The Ahearn and Soper Co. Ltd., Ottawa. (104)

Electro-magnetic relays. The 33 papers delivered at the Sixth National Conference on Electro-Magnetic Relays, Oklahoma State University, have been published in book form and made available through Potter & Brumfield Canada Ltd., Guelph, Ont. (105)

Coil winding machine catalogue No. 59 describes George Stevens Mfg. Co. coil winding machines, wire scraper, insulating equipment, winding formulas and accessories. A. W. Andrews and Associates, Port Credit, Ont. (106)

How NOT to use resistors. Requesting this folder places the reader under no obligation to laugh. General Transistor Corp., Jamaica, N.Y. (107)

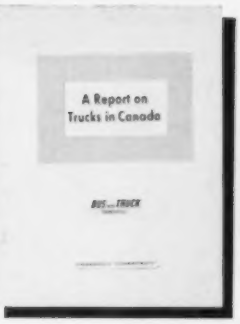
Electronic hardware reference manual No. 85 contains 75 pages of descriptions and specifications for plugs, jacks, binding posts, brackets, bumpers, handles, shields and many others. Amatom Electronic Hardware Co. Inc., New Rochelle, N.Y. (108)

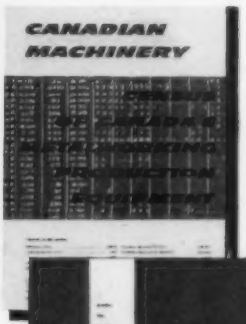
Radios, television, electrical appliances. Essco catalogue No. 581 contains 50 pages of equipment in stock. Electro Sonic Supply Co. Ltd., Toronto. (109)

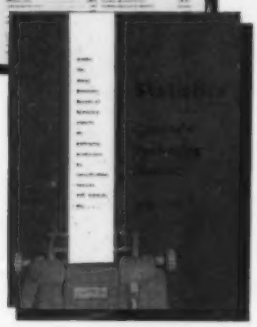
Nylon and fluorocarbon bobbins. All stock items of coil forms, bobbins and wire spools are listed in this catalogue issued by American Molded Products Co., Chicago. (110)

Maclean-Hunter has the facts on

CANADA







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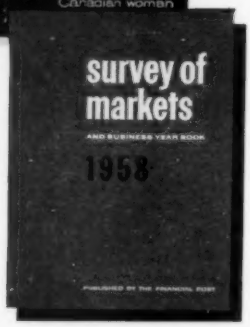


vital information you can use . . .

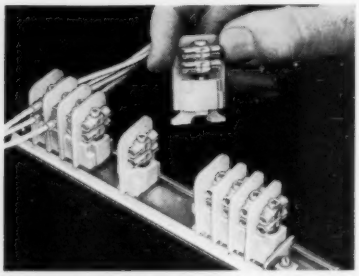
If you are interested in the Canadian market, write for any of this information. It is part of the data that has been compiled for the consumer, business and financial publications that form the Maclean-Hunter organization. This 71-year-old publishing company is probably the greatest single source of practical Canadian marketing experience. General information is issued in booklet form. More specialized enquiries are invited and answered individually.

Requests for any of the booklets shown above, or other information should be sent to the Research Department, Maclean-Hunter Publishing Co. Ltd., 481 University Avenue, Toronto 2, Ontario, Canada.

MACLEAN-HUNTER PUBLISHING COMPANY LTD.

Terminal strip can be built up using nylon compound modules

Based on the modular principle the new Modulok terminal block accommodates wire sizes no. 22-12. Individual modules may be snapped together then inserted on to a steel track and locked by end locks. The modules are made of Zytel 31, nylon compound having low water absorption characteristics. The tracks are available in any lengths up to 32 in. and 30 modules may be mounted per foot of track.



Modules have either 2 or 4 tier spring-loaded plated sockets which may be set out for quick-disconnect for rapid ring-out, bussing, or circuit changes. A twist of a screwdriver transforms the quick-disconnect into a permanent connection.

Burndy Canada Ltd., Toronto (111)

Magnetron rf supplies

A series of tuneable Magnetron R-F supplies from S through K_a bands are suited for use on antenna pattern ranges and other applications where a pulsed magnetron source is required. Each R-F supply is divided into three physical units: a modulator, an r-f source, and an optional remote control unit that permits complete control from any location.

Typical specifications for the r-f sources are: X-band: type 2J51 magnetron; tuneable, 8,500 to 9,600 mc; 35 kw nominal peak power. S-band: 2J66 magnetron; tuneable, 2845 to 2905 mc; 15 kw nominal peak power. Other units are tuneable where tuneable magnetrons are available.

Unless different values are requested, the modulators are supplied with a pulse rate of 1,000 pps (adjustable, ±20%) and a pulse width of one microsecond.

Electrodesign, Montreal. (112)

Diffused junction silicon rectifiers

Designed to bring miniaturization and high efficiency to such applications as miniaturized airborne power supplies, electrical instrument testing, oscilloscopes and other power supply requirements, a new series of diffused junction silicon rectifiers will provide currents up to six amperes over an inverse voltage range from 50 to 500 volts. These units, manufactured by International Rectifier Corporation, are operable at diode base temperatures up to 150 deg C.

To provide optimum reliability over their working temperature range, these hermetically sealed units feature an all-welded construction that is free from flux material. In addition, each unit is nickel-plated to provide minimum contact resistance and prevent corrosion.

Atlas Radio Corp. Ltd., Toronto. (113)

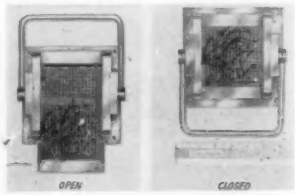
Cathode ray tube

A 12-in. cathode ray tube has been developed by Sylvania Electric Products for use in medical, radar and other oscilloscope equipment. Designated type SC-2558, the new tube uses electrostatic deflection, post deflection acceleration and an aluminized P7 screen. Signal voltage can be applied directly to the tube and screen phosphors other than the long persistence P7 are available.

Hackbusch Electronics Ltd., Toronto. (114)

Computer circuit patch panel

Dubbed the "256", this patch panel mounts on an aluminum panel 6x6x⅛ in. It inserts easily by means of a 5-in. lever. The Cambion-designed 2378 jack and 2379-1 plug assure positive contact at each of 256 points. Individual contacts have a minimum current capacity of one ampere. The D key in the jack's floating spring maintains a solid front at all times. All pins are heavily gold plated, .045 in. in diameter, and spaced .200 in. centres. Cambridge Thermionic will custom manufacture other configurations of this sure contact patch panel to meet special design requirements.



Cambridge Thermionic of Canada Ltd., Montreal. (115)

Two instruments measure true rms

A new rms detector circuit has been used in two new Bruel and Kjaer Instruments. They are the microphone amplifier type 2603 and the audio frequency spectrometer type 2110. Both incorporate these features: meter, switched to read average, peak or rms volts; voltage range from 100 microvolts to 1,000 volts full scale; sound level meter measurements; inputs via attenuator from precision microphone; provisions for driving vibration amplifiers and pickups; provision for 1/3 octave filtering from wave analysis.

When used with the appropriate accessories these instruments can be used for the following applications: a stable wide range rms voltmeter; an accurate sound level meter; a vibration meter; wide band wave analyser; amplifier with 100 db gain.

R-O-R Associates Limited, Don Mills, Ont. (116)

100-kv Norelco X-ray spectrograph

This new high-intensity X-ray spectrograph is continuously variable over the voltage range of 15 to 100 kv. Specimen holders are made to accommodate solid, liquid or powder specimens up to 2 in. diameter and thickness can vary from 1/16 in. to 1 in. It is designed to analyze metals, alloys, minerals, etc. It covers a range of 87 elements in the atomic scale extending from magnesium (No. 12) to californium (No. 98).

The specimen chamber contains two receptacles. When counting techniques are employed in an analysis, the second receptacle can be used for the calibrating standard or for a second specimen. Intensities are measured by scintillation or proportionate counters.

Philips Electronics Industries Ltd., Toronto. (117)

Multiple volt-ohm meter

The Siemens MULTITRON, a new wide-range multiple volt-ohm meter, is now available in Canada. The new Multitron has a measuring range for dc voltage from 1.5 v to 1,500 v, and for ac voltage from 30 cps to the highest frequencies of 250 mc. It will also measure resistance from 10 to 10^7 ohms. Nine clearly-marked scales permit fast, easy reading of these measurements. The Multitron's shock-proof measuring device has an angle of deflection of 100 degrees.

The Ahearn & Soper Co. Ltd., Ottawa. (118)

High resolution cathode ray tube

Type 5/71 CM micro-spot cathode ray tube is capable of resolving 5,000 lines. It has been developed primarily for airborne applications such as aerial mapping. The spot size is considerably less than 1/1,000-in. diameter.

The high resolution of the tube has been made possible by the use of an exceedingly fine screen and a new design of electron gun using two focusing elements, one of which is electromagnetic and external to the tube, while the other is electrostatic and of fixed focal length.

The tube has an optical flat face with a non-darkening glass and a short cylindrical bulb, coated—except over the screen surface—with a thick layer of plastic resin, enabling it to be operated under adverse atmospheric conditions, viz. 30 kv at 75,000 ft without danger of eht breakdown. Similarly, no tube socket is required, the leads to the rear end of the tube being encapsulated in a way which does not hinder the tube from being mounted easily in its focus and scanning assembly.

Ferranti-Packard Electric Ltd., Toronto. (119)

Polarized twin contact connectors

The new 31 series quick disconnect connectors are designed for use with RG-108 A/U cable and include the contact polarizing feature. They are designed for use in computer circuits where low signal levels and high sensitivity circuits make conventional coaxial cable inadequate. Specifications include: rating of 100 volts peak; weatherproof; bayonet lock coupling; captivated contacts in both plug and receptacle; polarized contacts to prevent mismating.

Amphenol Canada Ltd., Toronto. (120)

Alkaline cells

The new Eveready Energizer, a leakproof alkaline cell, has been designed to give up to ten times longer service than standard flashlight cells. The new cell will supply high currents in continuous service and will perform in temperature ranges of —40 F to +200 F. Currently they are available in two sizes, the standard "D" weighing 3.8 oz, and the half length "D", weighing 1.6 oz. The former has a short circuit amperage of 20, and the ½ "D", 8. Each cell has a nominal voltage of 1.5. The characteristics of the alkaline cell are such that it can be manufactured in other sizes and shapes, depending on the requirements of the application.

National Carbon Co., Toronto. (121)

Rectilinear and sector-motion potentiometers

Helipot custom-built slide-wire assemblies, rectilinear and sector-motion potentiometers can be built in many shapes and sizes with characteristics to fit many applications.

Any reasonable length from one inch up can be supplied. Resistance values range from 0.25 to 17,000 ohms per inch. Typical linearity tolerances are ±0.5% in one inch, ±0.15% in 3 in. and ±0.025% in 11 ft. Resolutions from 100 to 600 turns per in. are available. Power rating depends upon the installation and materials used, while breakdown voltage is 1,000 volts in most cases.

R-O-R Associates Ltd., Don Mills, Ont. (122)

Telegraph communication equipment

By transistorized circuitry and concomitant compact design, 18 channels of FS tone telegraph keying equipment have been designed to occupy panel space only 19 in. wide by 5¼ in. high by 18 in. deep. Eighten channels of FS tone telegraph converter equipment have been made to occupy panel space only 19 in. wide, 10½ in. high by 18 in. deep.

Northern Radio Manufacturing Co. Ltd., Ottawa. (123)

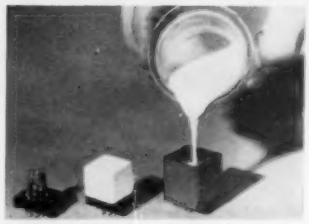
750 MA miniature silicon rectifier

Sarkes Tarzian have developed a new line of "F" series silicon rectifiers. Rated at 750 milliamperes d-c with voltage ratings of 200, 400 and 600 volts, these rectifiers are encapsulated into a volume less than 0.004 cu. in.

A. T. R. Armstrong Ltd., Toronto. (124)

Thermo-setting plastic

Stycast TPM-4 is a casting resin curable in the range of 400 F to 500 F. It is a rigid, thermosetting plastic with the following electrical properties. Dielectric Constant, 10^2 to 10^{10} cps, 2.2; dissipation factor, 10^2 to 10^{10} cps, below



0.0003; insulation resistance, 10^{16} ohm-cm; flexural strength, 12,000 psi; modulus of elasticity, 4.0×10^5; Izod impact, 0.3 ft lb/in. of notch.

Hexagonal steel bars have been embedded in Stycast TPM-4 and shocked from + 300 F to —70 F without failure.

M. J. Howard & Co., Ottawa. (125)

Measure small distances without contact

Designed to measure distances in the 0 to 45,000 micro-inches range, the new Wayne Kerr Electronic Micrometer, Type B-721, affords a method of measuring small distances without physical contact.

Measurement is by means of a transformer coupled bridge in conjunction with a non-contacting probe. The distance is measured in terms of the capacitance change between the test surface and the non-contacting probe.

This is particularly suited to measurements on rotating objects, and for monitoring distance with reference to a predetermined value. Because no physical contact is necessary, accurate determinations of temperature coefficient, moduli of elasticity, rigidity and bulk, Poisson's ratio and dilation are possible on fragile samples.

The standard for the bridge circuit is a three-terminal capacitor whose value is adjusted by a micrometer. The range covered by a particular probe is determined by the area of its end-surface, which is arranged to produce an accurate ratio with the standard micrometer capacitor plates. The micrometer scale is then magnified by the ratio of these two areas. The measured distance is given directly from the micrometer scale, thereby maintaining the normal reading precision associated with a micrometer.

The Glendon Co. Ltd., Toronto. (126)

Flame-retardant laminate

Flame-retardant and self extinguishing properties characterize Grade FR-1 paper-base laminate with a phenolic resin binder. This new grade possesses the general characteristics of Grade XX (a hard paper-base laminate). In addition, Grade FR-1 has excellent flame-retardance and self-extinguishing properties, plus high dielectric strength and resistance to moisture which make it well suited for many special electrical applications.

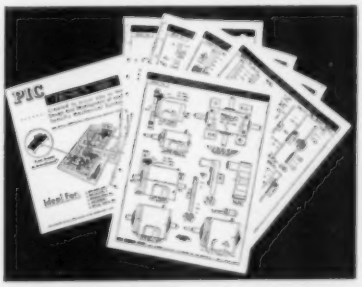
Available in sheets and strips, Grade FR-1 comes in standard sheet sizes of 36x36 in. and 36x72 in., and in thicknesses ranging from .031 to 1½ in.

Flexural strength of the new grade, psi, ⅛ in. thick, is 15,000 lengthwise and 14,000 crosswise; insulation resistance, megohms, condition—96 hours, 90% relative humidity, 95 deg F—60; maximum constant operating temperature, 275 deg F; NEMA flammability test — ignition time, 120 seconds, and burning time, 30 seconds; ASTM flame test—30 seconds dwell in flame/cycle—seconds to extinguish per cycle: 5. Standard color of Grade FR-1 is red, and standard finish is semi-gloss.

Synthane Corp., Oaks, Pa. (127)

Templates aid drafting

A complete package of over 14 design tracing templates is available free of charge. The tracing templates were created to assist designers, engineers and all those associated with the development of specific mechanical systems.



These templates stress the economy of engineering and detailed drafting time. They can be used for breadboard layouts, prototypes, design production, technical sketching and detailed part drawings. They save engineering and designing time and cover numerous basic mechanical components such as gears, dials, cams, differentials, hand cranks, shafts, pulleys, speed reducers and couplings.

The templates consist of actual size drawings. When placed under the tracing paper they facilitate the drawing of mechanical components.

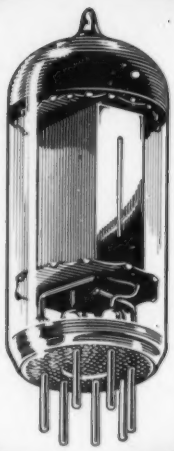
Tecneek Associates, Montreal. (128)

(Continued on page 53)

The 5727 miniature Thyratron is one of a line of Rogers Special Quality* Tubes designed to give reliable performance in all relay or grid controlled rectifier applications.

This ruggedized tube has an improved heated cathode construction and is recommended as a replacement for the 2D21 and 2D21W where reliability is of the utmost importance. The 5727 Thyratron has an inverse voltage of 1300. Its average cathode current is 100 mA.

**Rogers Special Quality tubes are finding more and more applications in all types of professional equipment. The greater reliability and lower maintenance cost of the apparatus in which they are used more than compensates for the higher initial cost.*



ROGERS

electronic tubes & components

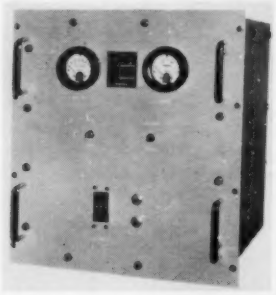
A DIVISION OF PHILIPS ELECTRONICS INDUSTRIES LTD.

116 VANDERHOOF AVENUE, TORONTO, ONTARIO / BRANCHES: MONTREAL, WINNIPEG, VANCOUVER

★ Rogers Electronic Tubes are sold through Canada's Independent Electronic Parts Distributors

DC transistor power supply

Perkin power supply model M-1136A operates from an ac input of 208 volts, ± 10%, 3 phase, 57-63 cps, Output is 24-32 vdc at 100 amperes. It has a dc current overload capacity of 125 amperes



for a duration of 15 minutes. Static regulation accuracy is ± 0.1% for line changes from 187-229 vac and 0.1% for changes from no load to full load. Dynamic regulation is 0.1% for step changes of 10 volts in the ac line between 187-229 volts and dynamic load regulation is 2 volts for step changes from no load to full load or full load to no load.

Electromechanical Products, Agincourt, Ont. (129)

Germanium diodes

Two major classifications of germanium diodes are being produced by Ohmite. One is a line for general purpose and computer use, in which from one to four operating characteristics are specified. The other line covers special computer diodes in which ten operating characteristics are specified.

Ohmite Manufacturing Co., Skokie, Ill. (130)

Lightweight thermal heaters

A newly developed technique for fabrication of electrical heaters results in lightweight, thin, flexible units for airborne and electronic equipment applications.

Typical of the new Thermal-Heaters is the 43-watt circular heater weighing less than ¼ oz. (including 12-in. leads). This heater, less than .030 in. thick over the element and less than .065 in. thick over the leads, may be clamped or cemented in place. Flexible construction permits application to flat or curved surfaces. Insulation resistance is 1,000 volts rms. Heaters in various sizes and shapes are fabricated to customers' specifications.

Minco Products Inc., Minneapolis, Minn. (131)

Wide band switchable ferrite duplexer

This ferrite switchable duplexer provides a complete transfer in three milliseconds from the wide beam to the pencil beam. By reversing the current through the magnet coils the rf path may be changed from one waveguide output to the other. Transmitter output can be switched from one antenna to the other without shutting down.

Airtron Canada Limited, Toronto. (132)

UHF connector can be dip soldered

A new 83 series uhf round-nose connector is now available allowing the use of dip-soldering on the centre contact. This simplifies the soldering technique and reduces soldering time. Voltage rating is 500; dielectric material is mica-filled bakelite; it mates with all uhf receptacles and uses standard uhf reducing adapters.

Amphenol Canada Ltd., Toronto. (133)

(Continued on page 54)

Imbedded printed circuits

Imbedded in the base material and protected by an insulating cover, "Imbedded Circuitry" offers reliability in printed circuits. The base material is epoxy fiberglass, 62-thousandths thick. Other materials are available. The conductor lines are rolled copper 3-thousandths thick and 62-thousandths wide. With their beveled edges they are locked in place when imbedded in the plastic. Terminals and contacts are 6-thousandths thick. Conductors, terminals and contacts are one solid piece.

Beck's, Inc., St. Paul, Minnesota. (134)

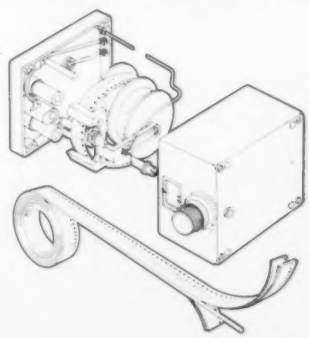
Strain gauge measuring bridge

With the aid of the Model PR 9302 Strain Measuring Bridge, both static and dynamic, mechanical or physical phenomena, such as strain, vibrations, force, pressure, torsion, displacement, etc. can be measured using either, or both, the mill balance and direct deflection methods. Technical specifications include a measuring frequency range of 0-1000 cps, an accuracy within ±1% with the mill balance technique and a carrier wave frequency of 4,000 cps. Stability is assured with a minimum drift in the "datum check" position which never exceeds 2 microstrains. Calibration and compensation circuits are included, as are a meter and tuning eye, separate terminals for an additional moving coil meter, an oscilloscope and an oscillograph.

Philips Electronics Industries Ltd., Toronto. (135)

Slidewire-tape potentiometer

The basic active element of the Ta'Pot H5600 potentiometer is a resistance wire bonded within the edge of a laminated mylar tape. The resistance wire may be either straight or in helicoil form, depending on the total resistance required, and is available in lengths of 120 in.



Resistance ranges are from 100 ohms to 100 k. The case dimensions are 2 in. by 2¼ in. by 2¾ in. deep.

Readout is direct through a window

on the front of the case. With the calibration stamped on the tape, any linear or non-linear calibration is obtainable including direct digital reading of temperature with any type of thermocouple, square root extraction when used with differential pressure transducers for flow measurement, and hyperbolic and logarithmic functions encountered in analysis and radiation systems.

Each Ta'Pot is calibrated on an automated system that compares the unit under test with a master tape 60 ft long. During calibration, digital values as specified are automatically printed along the face of the tape. A thousand calibration points are printed on the 120-in. scale, the tape length.

Howell Instrument Co., Fort Worth, Texas. (136)

Clip-on dc milliammeter

Hewlett-Packard Model 428A clip-on dc milliammeter provides a time-saving

method of measuring dc current. It employs a pen-sized probe which clips around a wire without interrupting the circuit. It has full scale current ranges from 3 ma to 1 ampere in 6 steps. Accuracy is ± 3% and is unaffected by line voltage changes, instrument aging or the earth's magnetic field. For extremely low current level measurements, dc sensitivity can be increased by making one or more loops of the conductor through the jaws of the probe.

Atlas Instrument Corp. Ltd., Toronto. (137)

High voltage electrostatic generators

The Sames generators (Société Anonyme de Machines Electrostatiques, Grenoble, France), are compact and better regulated compared to transformer-rectifier-filter-type suplies in similar kilovolt ranges. Available with adjustable outputs of 50, 80, 100, 140, 150, 250, 300 and 600 kilowatts, these power supplies have found wide application for testing of cable insulation, alternator windings and other dielectrics, flocking, electrostatic painting and precipitation, electron and nuclear particle accelerators and similar applications. In addition, the electrostatic generators are available in voltage-stabilized models that are particularly suitable for electron-microscopy and other critical applications.

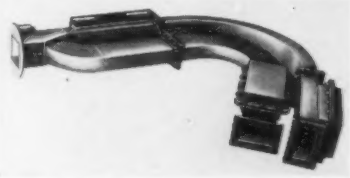
Beta Electric Div. of Sorenson & Co., South Norwalk, Conn. (138)

(Continued on page 56)

Dual feed horn

A dual polarized feed horn for large size waveguide having two waveguide inputs has just been developed and put into use. The unique feature of this primary feed is the waveguide input, since the usual dual polarized horn requires a coax input.

The new feature has the advantage of providing the same centre of radiation for both signals. Maximum power transmission is obtained in both polarizations. The horn handles 10 kw with more than 30 db decoupling between the signals.



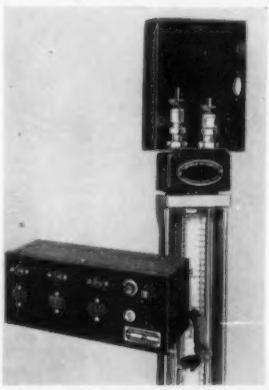
The horn has been produced in the frequencies of 1700-2400 mc, 755-985 mc and 400-450 mc, but the design is available in other frequencies.

D. S. Kennedy & Co., Cohasset, Mass. (139)

Manometric-electronic pressure switch

Consisting of a contactor manometer and a relay-power supply package, this switch unit may be used for alarm signaling and control in applications involving pressure, vacuum, differential pressure, flow and liquid level.

The indicating fluid has a specific gravity of 1 and gives a make or break control sensitivity of 0.005 in. of water. The instrument can sense pressure increments as small as 0.003 oz per sq. in. with dependability.



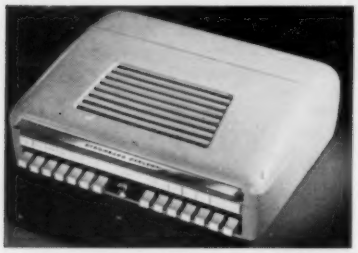
Switching functions are handled by the Manotac relay-power unit which operates at 110 vac. It features modular construction that makes use of interchangeable plug-in circuit cards. Each carries all components governing one contact point on the manometer and may be removed or inserted without affecting op-

eration of other points. They are available in five models designed for one to five contact points. Contact capacity is five amps per point at 115 vac.

Meriam Instrument Co., Cleveland, O. (140)

Intercommunication system

The Key-Municator loud-speaking intercommunication system provides channels for up to 12 master or remote stations. It can be expanded in blocks of 14 stations by the addition of compatible bases.



Each remote station is a 2-channel unit providing 2-way voice communication with either of two master stations. Channel selection is accomplished simply by pressing the proper select button. This alerts the called station by either a visual or audible signal or both. Each remote unit is equipped with a privacy switch which prevents the transmission of noise or extraneous conversation to other stations.

If a called master station does not answer, the signal light at that unit remains lighted, showing that a call was made and where it originated.

It is impossible for any remote unit to lock out a call from the master station. Equipment is fully transistorized.

Hackbusch Electronics Ltd., Toronto. (141)

Economy silicon rectifiers

Featuring an average rectifier forward current of 750 milliamperes, the new T1 rectifiers are packaged in a nylon-cased epoxy capsule and pass MIL-STD-202A immersion tests. This shell provides an insulated case with minimum lead-to-case insulation resistance of 10^{10} ohms at 600 volts. Typed as the 1N2069, 1N2070 and 1N2071, the three silicon rectifiers have peak inverse voltages of 200, 400 and 600 volts, respectively. They also highlight a six-ampere recurrent peak current and a surge (turn-on) current over 32 amperes for one millisecond.

In order to insure performance under actual operating conditions, the new 1N20270 series rectifiers are 100% preship tested to all electrical specifications at 100 deg C. These dynamic tests have a maximum forward voltage drop of 0.6 volts and 0.2 milliamps maximum full cycle average reverse current with a 500 mA forward current and PIV applied.

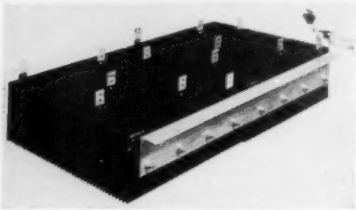
High conductivity leads allow easy solderability at temperatures up to 300 deg C for five seconds and 275 deg C for 15 seconds in accordance with MIL-T-19500A soldering tests.

Texas Instruments Inc., Ottawa. (142)

(Continued on page 58)

High current density selenium rectifier plates

Vacuum deposition is employed to make these new high current density selenium rectifier plates. The manufacturer claims that they can be operated continuously at twice NEMA ratings, with only a slight temperature rise of



15 to 20 degrees C. A reverse voltage of 26 volts rms is standard but 33-volt plates are available. The plates are available in a complete size range.

Canadian Line Materials Ltd., Toronto. (143)

Plug-in electronic voltmeter

Model SPD-21 is a d-c package that may be used with other components to measure from one to 1,000 volts. It contains complete VTVM circuitry but does not include the meter, calibration control, zero adjust, or the input voltage divider that selects the voltage range desired.

With this unit, meters being utilized for other purposes may also be used for electronic voltage measurement.

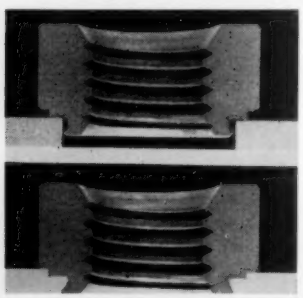
Model SPD-21 occupies only 4½ sq. in. in cross section. Dimensions are 2x2¼x5¼ in.

With an input resistance of 10 megohms, it imposes almost no load on the circuit being measured. Its accuracy is plus or minus 3%. Meters used with the circuit should have a minimum sensitivity of 250 microamperes, maximum of 50 microamperes. Input power required is 115 volts, 50 to 400 cps, single phase.

Metronix Inc., Chesterland, O. (144)

Fasteners for use in thin metal

High-strength, load-bearing threads can now be put into thin-gauge sheet metal with low installation pressures. Called



the SPS Swage Nut, the female-threaded fastener can be anchored firmly in sections as thin as 0.02 in., or as thick as 0.25 in. It can be swaged into sheet metal up to a Rockwell C-scale hardness of 25.

The SPS nut is strong enough to permit wrenching a 160,000-psi screw to failure without failing itself. They are available in screw-diameter sizes No. 2 through ½-in. Threads are class 2B.

Standard Pressed Steel Co., Jenkintown, Pa. (145)

High-speed solenoid

The compact R.S. 5174 solenoid is designed to operate with a 24-lb. load. The start of the .020-in. stroke occurs at a maximum of 14 milliseconds, and it completes its travel in less than 20 milliseconds from circuit closing. The unit is specified for operation in an ambient temperature range of from —65 to +160 deg F. Voltage rating is 24 volts d-c at 78 deg F. At this temperature, coil resistance is 19.2 ohms.

Over-all size of the Model R.S. 5174 is 1.65 in. high, with a 2-in. diameter case. A square mounting flange with four holes is an integral part of the case.

Telecomputing Corp., Los Angeles. (146)

Mica wafers for transistors

Perfection Mica Co. has developed a new line of low-priced mica film wafers which increase reliability of transistors and other semi-conductor products. The mica is of a low-cost non-critical grade ideally suited for this application and now available in unlimited supply. The wafers are pre-punched to fit a wide variety of bases and are used for electrically insulating the base from the heat sink. Interference with heat transfer is negligible because the thin mica film offers a low thermal gradient as well as high structural strength, thereby increasing reliability.

Perfection Mica Co., Chicago. (147)

Arc resistance tester

Canadian manufacturers of electrical insulating materials, such as panel boards, varnished cambric, fibre, mica, etc. can now purchase a made-in-Canada arc resistance tester. This self-contained unit will determine the arc resistance of solid electrical insulating materials as given under "ASTM" specification D495-42. The tester comprises a continuously variable source of high tension adjustable from 0 to 15 kv, with arc current read on a milliammeter and limited to 30 ma maximum. The power may be applied steadily or pulsed through combination switching.

The potential is applied to the test panel by a counter-balanced jig with fewer tungsten electrodes. The applicator is enclosed behind a ventilator cage equipped with a safety switch to protect the operator. Input is 115 volts 60 cps. 25 cps models are available.

Canadian Research Institute, Toronto. (148)

Lightweight portable radiotelephone

Lightweight portable medium frequency radiotelephone model PRT-20 weighs 90 lb. complete with batteries. It covers a frequency range of 2 to 6 mc, and has a power output of 1½ watts. The set has been partially transistorized and uses miniature components throughout. Transceiver batteries, microphone, wire aerial and instruction manual are all contained in a compact leather carrying case measuring 8¼ in. by 11¼ in. by 4½ in.

It can be used as a fixed station with heavy-duty batteries and a pre-cut aerial or used in the field with its lightweight batteries and a random length of antenna wire. For use as a portable radiophone, a clip-on whip antenna fastens to the end of the case.

Spilsbury & Tindall Ltd., Vancouver. (149)

High-speed impact switch

The single-action UFIS (ultra-fast impact switch) has been designed for missile, drone, projectile, sled and other speed - measurement requirements. It possesses a controllable time limit range from 90 to 200 microseconds. It can be supplied in 95% nonmetallic materials,

appropriate for installation in a nose cone radar-seeker compartment. Temperature range is —80 F to + 185 F.

Servonics Engineering Services Co. Inc., Sherman Oaks, Calif. (150)

Contact meter controller

C'Trol contact-meter-controller combines a contact meter with a transistorized amplifier and power supply controller. When mounted together the contact meter and the controller join together with a plug connection. When the meter is to be mounted remotely from the controller, an interconnecting cable is supplied.

Reset is automatic but manual reset can be provided if single locking action is necessary. Silk screened scales are made to customers' requirements.

Waters Manufacturing, Inc., Wayland, Mass. (151)

From our readers

Defense spending

I want to compliment you on your editorial, Page 19, of the November issue. You have certainly scored with an accurate analysis of the problem created by the Canadian Government decision of September 23, to cancel the Astra and Sparrow programs. It is unfortunate that a replacement program was not worked out prior to stopping the wheels of progress, which Canada had been turning for the past five years in the electronics and scientific research programs.

The saddest part of the problem is that once these wheels of progress are stopped, it will possibly require six months to nine months before they are again moving smoothly on other contracts or research programs. During this changeover period a serious and costly loss of scientific personnel will have occurred. It then becomes a problem of balancing the economic losses against the theoretical savings by terminating such programs. A 10% cut in the United States' program for research and development seemed to cause serious economic problems, which are just being overcome. It is my personal hope that the executives in the Canadian Government can bring forth replacement programs promptly to save the scientific and research and development teams that have been built up.

Canadian industry has the capability and potential for efficiently manufacturing all sorts of systems and products. It would be a shame for Canada to just sit back and assume the attitude of "what's the difference if we get into difficulties, we will have the benefits of the products and military equipment developed by the United States." It is highly possible that Canada can reverse some of this attitude, and move ahead with certain independent and original ideas. The Orenda Engine Development certainly proved Canadian capability for leading with specific jet engine development and advancements.

Charles F. Conrad,
President,
Conrad, Inc.,
Holland, Mich.

Solar cells

On page 60 of your September, 1958, issue you show a picture in which Ghana's Minister of Trade and Industries is discussing the possibility of using solar cells to power radio receivers in remote villages of Ghana. The caption states that the idea was presented by a gentleman from Hoffman Electronics Corporation.

The application of solar energy is a subject in which I am keenly interested and the caption thus drew my attention, but this instance was even more interesting because in September, 1957, I wrote to Hoffman discussing the very same idea.

The science of applied solar energy is in my opinion a field with huge possibilities. Enquiries as to the availability of solar-powered equipment are received in the U. S. A. from Australia, India, Israel, and various other countries where fuel costs are high and the cost of operating conventional equipment is burdensome as a result. Many islands in the West Indies have a similar problem. These countries need a source of cheap power and sunlight is one commodity which they have in profusion.

The U. S. A. and Russia, alive to the future possibilities, have active research programs in this field. Russia is reported to be building a solar power station in Armenia which will be capable of generating 2,500,000 kw per year. A solar energy research program has been going on at the University of Wisconsin for several years. Curtiss-Wright and New York University have announced the establishment of programs for research, development, and practical application of solar energy. Some of the applications being studied are: heating and air conditioning, salt water distillation, refrigeration, stoves and other household appliances, and power generation. Solar furnaces for high temperature research are already in operation.

In view of the fact that many of the countries in which a market for this equipment will exist are in the Commonwealth, it seems rather strange that no Commonwealth country has announced a research program in the field. When the products are released and the purchases commence, Commonwealth industry and labor may be watching from the sidelines.

John R. Wood,
St. Paul L'Ermite, Que.

Canadian Electronics Engineering is always pleased to receive the comments of its readers on any subject pertaining to electronics science, technology or industry. Letters should be addressed: Harold Price, P.Eng., Editor, Canadian Electronics Engineering, P.O. Box 100, Toronto, Ont.

ATTENTION!

The Second International Exhibition of Electronic Components

will be held from the

20th to 24th

of February, 1959

at PARIS, FRANCE

EXPOSITION PARK

PORTE DE VERSAILLES

The greatest presentation in the world in the field of Electronics

FOR FURTHER INFORMATION WRITE TO:

Fédération Nationale des Industries Electroniques (S.D.S.A.)

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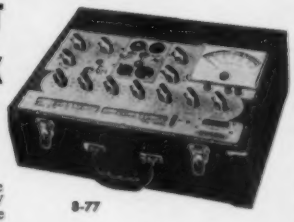
A Fine Complement of Tube Testers

You TEST BEST with STARK



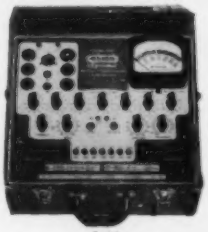
8-77

RADIO & TV TECHNICIANS

Model 8-77: Every up-to-date requirement in a Radio & TV Technician's Vacuum Tube Tester has been incorporated in this compact 16 lb. portable tester. You can check filament voltages in 18 steps from 0.6 to 117 volts . . . check scale readings directly on the 3-range micromho scale (0-3,000; 6,000; 15,000). Includes such outstanding features as:

- **Stark-Hickok *Dynamic Mutual Conductance**
- **High Speed Short Test (12 times more sensitive!)**
- **Grid Current Test**
- **Filament Continuity Test**
- **Reserve Cathode Capacity Test**

Exclusive New Socket Design: Snap-in Master Socket Panel slips off easily, exposing new 11-pin socket and saves time in replacing worn-out sockets.



9-66

Radio, TV, and Industrial Tube Tester

Model 9-66: A more complete *Dynamic Mutual Conductance Tube Tester equipped to test all present day tubes including Octal, Loktal, Miniature, Ballast, Magic Eye, and Sub-miniature tube types. Tests Grid Controlled Rectifier Tubes used in industrial applications . . . tests complete complement of 600 mil series of tubes . . . tests Gas-filled Rectifier and Starter Tubes. Provision is made for new tube designs. Provides Vital Life test . . . Noise test . . . Gas test for rapid disclosure of tubes affecting AVC and IF stages. Scale readings are read directly off the 3-range micromho scale (0-3, 000; 6, 000; 15, 000) in both English and True Micromhos. Uses rectifier current to energize both plates and grids, 2 rectifiers. Will check TV picture tube with added purchase of low cost CRT adapter.

NOW . . . Test Both American and Foreign Tubes

9-66U

Model 9-66U Universal Tube Tester: With the inclusion of permanently wired. foreign base type sockets, the 9-66U will test both American tubes, and Foreign tubes having the following bases: B9G, B3G, B8A, B4, B5, B7, B8G, and MO. Incorporates all the accurate tube testing features of the Model 9-66 including *Dynamic Mutual Conductance.

Write for full particulars

***Dynamic Mutual Conductance:** The time-proven and patented Stark-Hickok method of precise voltage calibration that assures you of professional tube testing accuracy. The Mutual Conductance principle and circuitry has been accepted and used by the Canadian and American Armed Forces.

TUBE DATA SERVICE

For a nominal sum of $4.00 annually (3 years $9.00) we will supply one new roll chart plus three supplements listing the very latest tube data.

STARK fine instruments

STARK ELECTRONIC INSTRUMENTS LTD.
Factories and Sales Office: Ajax, Ont.
Foreign Division: 276 West 43rd Street
New York 36, N.Y., U.S.A.

For further information mark No. 46 on our Readers' Service Card

Defense contracts

Unclassified electronics contracts for $10,000 or more have been awarded to the following Canadian firms by the Department of Defence Production. The number in parenthesis indicates that the amount is the total of that number of contracts.

October 16-31, 1958

Ahearn & Soper Co. Ltd., Ottawa, recorders and accessories and radiac equipment, $37,577 (2).

Ampex American Corp., Toronto, equipment, $114,667 (2).

Burgess Battery Co., Niagara Falls, batteries, $35,350.

Canadian Arsenals Ltd., Ottawa, testing of electronic equipment, $254,000.

Canadian Aviation Electronics Ltd., Montreal, technical services, $16,768.

Canadian General Electric Co. Ltd., Toronto, radar spares and tubes, $143,188 (2).

Northern Electric Co. Ltd., Ottawa, telephone spares, $26,795.

Northern Radio Manufacturing Ltd., Ottawa, telecommunications equipment, $17,842.

Pye Canada Ltd., Toronto, underwater tv system, $24,214.

Radionics Ltd., Montreal, radiacmeters, $80,988.

Sperry Gyroscope Co. of Canada Ltd., Montreal, repair and overhaul, $15,000.

Standard Telephones & Cables Mfg. Co. (Canada) Ltd., Montreal, equipment, $127,145 (2).

Wild of Canada Ltd., Ottawa, equipment, $53,247.

November 1-15, 1958

Abercorn Aero Ltd., Montreal, equipment, $64,418.

Beaconing Optical & Precision Materials Co. Ltd., Montreal, equipment, $86,108.

Canadian General Electric Co. Ltd., Ottawa, electrical cable, $15,645.

Electric Storage Battery Co. (Canada) Ltd., Toronto, batteries, $133,001 (2).

Gould-National Batteries of Canada Ltd., Toronto, batteries, $117,642.

I. T. & T. Electronics Service Co. of Canada Ltd., Montreal, installation of microwave stations, $21,350.

Northern Radio Mfg. Co. Ltd., Ottawa, remote control systems, $19,259.

Philips Electronics Industries Ltd., Toronto, tubes, $43,182 (2).

RCA Victor Co. Ltd., Ottawa, equipment, $49,831.

T. D. K. Rooney Construction Co. Ltd., Montreal, renovation and installation of tactical air command radio facilities, $25,896.

Advertisers' Index

CHANGE OF ADDRESS?

Please notify us immediately when moving from your present address.

By so doing you will continue to receive your copy of **CANADIAN ELECTRONICS ENGINEERING** each month without interruption.

Canadian engineers will discuss space travel and missiles

The Institute of Radio Engineers, Toronto Section, and the Canadian Astronautical Society are co-operating in a series of two technical meetings to be held in Toronto during the spring of 1959.

On March 16, David C. Wallis will lecture on "Rockets and space travel." Mr. Wallis is senior weapons systems analyst, The Avro Aircraft Company.

On April 27, Dr. Philip A. Lapp will lecture on "The elements of guided missiles." Dr. Lapp is senior project engineer, The De Havilland Aircraft of Canada Ltd.

Although there is very little work being done in Canada on space travel, there is keen interest among such groups as IRE and CAS. It is this "unofficial" interest and activity that will provide Canada with a nucleus of experienced scientists and engineers when the government or private industry decides to enter the field.

Instrumentation symposium

The Canadian Aircraft Industry Instrumentation Symposium will be held in Toronto, March 12 and 13, 1959. The general theme will be "The nature and status of instrumentation in the Canadian aircraft industry."

This is the first time that the Canadian aircraft industry has planned for a meeting of this type. The symposium is being organized by the Toronto section of the Instrument Society of America. Further details may be obtained from J. Pefhany, General Chairman, c/o Orenda Engines Ltd., Box 4015, Terminal 'A,' Toronto.

Writers have key role in communications

"The volume of important new technical information now threatens to overwhelm the responsible reader. Specialists find it difficult to stay abreast of essential reading in their own fields and almost impossible to keep up with developments in neighboring fields. As a result, publications which are overly difficult to read or which do not come to the point quickly tend to go unheeded no matter how important their content. It is the responsibility of the members of your group to make such technical information available in an effective written form—the vital service you are rendering is important to the whole of free society."

So said Dr. James R. Killian Jr. Special Assistant to the President for Science and Technology in a telegram sent to the chairman of the sixth annual convention of the Society of Technical Writers and Editors, held in Washington, D.C., on November 17 and 18, 1958. His mesasge best expressed the purpose and theme of a convention which attracted over 1,000 writers and editors in the scientific and technical fields. In addition to the opportunities for exchange of information and opinions, and an interesting group of exhibits, the convention offered fifteen highly instructive sessions.

Charter for Central Ontario Chapter of STWE was presented to chairman J. Simpson (r) at national convention.

Will fewer students enter engineering?

Will the rising cost of university education, and the lack of clear government policies on many issues, have an adverse effect on the number of students entering the engineering courses?

Yes, claims the Engineering Institute of Canada. Although it might be a temporary decline, there were fewer new registrations in 1958 than in 1957. Figures were 4,572 against 5,132—a drop of 11%. The total registration of all engineering students is up 2% from last year.

No, claims Premier Frost. Speaking at the opening of the new chemistry and chemical engineering building at Waterloo College, he predicted that university applications for all courses in Ontario would double by 1965.

One thing for sure, engineering education is not slacking off in the USSR. 83,000 engineers graduated in 1957.

COMING EVENTS

January 1959

12-13 Reliability & Quality Control National Symposium. Philadelphia, Pa.

February

1-6 AIEE Winter General Meeting. Statler Hotel, New York.

12-13 Solid-State Circuits Conference. Philadelphia, Pa.

20-24 Second International Exhibition of Electronic Components. Paris, France.

March

2-6 Western Joint Computer Conference. San Francisco, Calif.

23-26 Radio Engineering Show and IRE National Convention. New York.

April

5-10 Fifth Nuclear Congress. Cleveland, Ohio.

6-9 British Radio and Electronic Component Show, Grosvenor House and Park Lane House, London, W.1.

16-18 Southwestern IRE Regional Conference & Electronics Show. Dallas, Tex.

16-30 Engineering, Marine, Welding & Nuclear Energy Exhibition, Olympia, London.

May

4-6 National Aeronautical and Navigational Electronics Conference. Dayton, Ohio.

4-8 National Industrial Production Show of Canada, Exhibition Park, Toronto.

6-8 1959 Electronic Components Conference. Philadelphia, Pa.

What's the market for airborne gear?

Correspondent Gordon Elder has been surveying the aircraft industry in Canada to find out what communications equipment is in use in Canada, and what the owners expect to buy in the near future. This market survey will be featured in the February issue of CEE.

Could you use a general purpost transistor power supply? F. S. Goulding and R. A. McNaught, Atomic Energy of Canada Ltd. will describe one they have designed.

As a sequel to the articles on the Tandem Van de Graaff, CEE, July, 1958, Dr. Allen of Harwell has written to describe the work being done there on two vertical tandem machines.

Free service for our readers

Keep your reference shelf up to date this easy way. All advertisements, new products and literature in this issue have a key number. For more information

- Circle the key number on one of these cards
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AT LAST!
A Precision 200 KC Scope with Dual Trace Presentation!

NEW MODEL 122A

Here at last is a 200 KC oscilloscope—priced at just $625—giving you "big-scope" versatility and the time-saving convenience of simultaneous two-phenomena presentation.

Engineered to speed industrial, mechanical, medical and geophysical measurements in the 200 KC range, the new hp 122A has two identical vertical amplifiers and a vertical function selector.

The amplifiers may be operated independently, differentially on all ranges, alternately on successive sweeps, or chopped at a 40 KC rate.

Other significant features include universal optimum automatic triggering, high maximum sensitivity of 10 mv/cm, 15 calibrated sweeps with vernier, sweep accuracy of ±5% and a "times-5" expansion giving maximum speed of 1 μsec/cm on the 5 μsec/cm range. Trace normally runs free, syncing automatically on 0.5 cm vertical deflection, but a knob adjustment eliminates free-run and sets trigger level as desired between −10 and +10 volts. Rack or cabinet mount; *rack mount model only 7" high.*

For complete details, write or call your hp representative, or write direct.

HEWLETT-PACKARD COMPANY
Represented in Canada by
ATLAS INSTRUMENT CORPORATION, LTD.
50 Wingold Avenue, Toronto 10, Ontario
106-525 Seymour St., Vancouver 2, B. C.
72 Princess Street, Winnipeg, Manitoba

BRIEF SPECIFICATIONS hp 122A

Sweep: 15 calibrated sweeps, 1-2-5 sequence, 5 μsec/cm to 0.2 sec/cm, accuracy ±5%. "Times-5" expander, all ranges. Vernier extends 0.2 sec/cm range to 0.5 sec/cm.

Trigger selector: Internal + or −, external or line. Triggers automatically on 0.5 cm internal or 2.5 v peak external. Displays base line in absence of signal. Trigger level selection −10 to +10 v available when automatic trigger defeated.

Vertical Amplifiers: Identical A and B amplifiers, 4 calibrated sensitivities of 10 mv/cm, 100 mv/cm, 1 v/cm and 10 v/cm; ±5% accuracy. Vernier 10 to 1. Balanced (differential) input available on all input ranges. With dual trace, balanced input on 10 mv/cm range. Input impedance 1 megohm with less than 60 μμf shunt. Bandwidth DC to 200 KC or 2 cps to 200 KC when AC coupled. Internal amplitude calibrator provided.

Function Selector: A only, B only, B-A, Alternate and Chopped (at approx. 40 KC).

Horizontal Amplifier: 3 calibrated sensitivities, 0.1 v/cm, 1 v/cm, 10 v/cm. Accuracy ±5%. Vernier 10 to 1.
Bandwidth DC to 200 KC or 2 cps to 200 KC, AC coupled.

General: 5AQP1 CRT, intensity modulation terminals at rear, power input approximately 150 watts, all DC power supplies regulated.

Price: (Cabinet or rack mount) $625.00.

Data subject to change without notice. Prices f.o.b. factory.

hp now offers 8 different precision scopes

For further information mark No. 32 on our Readers' Service Card

15,000 WATTS P. E. P.
New Ceramic Tetrode for SSB

Eimac's new, high-power 4CW10,000A is ideal for use in Class AB_1 single sideband service. This new tetrode is a water-cooled version of the widely-used Eimac 4CX5000A, with plate dissipation capability increased to 10,000 watts and a peak envelope power of 15,000 watts. Water-cooling makes the 4CW10,000A excellent for heavy duty applications where reserve plate dissipation is required.

Eimac offers the most complete line of tetrodes with the high-power gain, low distortion and excellent stability required in Class AB_1 operation. Each has proved reserve ability to handle the high peak powers encountered in single sideband service. Efficient integral-finned anode coolers on the air-cooled types keep blower requirements to a minimum, allowing compact equipment design.

Ceramic-metal design means compactness, ruggedness, high performance, and reliability. These proved advantages of Eimac ceramic tetrodes make possible more compact, efficient single sideband equipment.

Eimac

Eimac First for high power amplifier klystrons.

EITEL-McCULLOUGH, INC.

SAN CARLOS CALIFORNIA

CANADIAN REPRESENTATIVE
R. D. B. SHEPPARD
2036 Prince Charles Road, Ottawa.

CLASS AB_1 SSB OPERATION

	4CX250B	4CX300A	4CX1000A	4CX5000A	4CW10,000A
Plate Voltage	2000 v	2500 v	3000 v	7500 v	7500 v
Driving Power	0 w	0 w	0 w	0 w	0 w
Peak Envelope Power	325 w	400 w	1680 w	10,000 w	15,000 w

For further information mark No. 26 on our Readers' Service Card